SUNNYSIDE COMBINED HYDROCARBON LEASE CONVERSION

DRAFT ENVIRONMENTAL IMPACT STATEMENT

NOVEMBER 1983

DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

COVER SHEET

Sunnyside Combined Hydrocarbon Lease Conversion Environmental Impact Statement

(X) Draft ( ) Final

Lead Agency

U.S. Department of the Interior, Bureau of Land Management

Cooperating Agencies

U.S. Department of the Interior
Bureau of Reclamation
Fish and Wildlife Service
National Park Service

U.S. Department of Agriculture
Agricultural Stabilization and Conservation Service

U.S. Department of Transportation
Federal Highway Administration

Counties That Could Be Directly Affected

Carbon County, Utah
Emery County, Utah

Abstract

This EIS assesses the environmental consequences of federal approval of conversion of existing oil and gas leases within the Sunnyside Special Tar Sand Area (STSA) to combined hydrocarbon leases. These lease conversions are proposed by 5 applicants—Amoco Production Company, Chevron USA Inc.-GNC Energy Corporation, Enercor, Mono Power Company, and Sabine Production Company. Each applicant has submitted a plan of operations for converting these leases. This EIS addresses the collective and cumulative impacts of the proposed actions, a partial conversion alternative and/or special mitigation, a unitized development alternative, and a no action alternative. Collective impacts are those impacts that would occur as a result of the proposed actions and alternatives. Cumulative impacts are those impacts that would occur as a result of the proposed actions and alternatives plus other interrelated projects planned for development in the Sunnyside STSA during the analysis period.

Development of tar sand would increase total dissolved solids, water temperatures, and suspended sediment while decreasing flows in tributaries to the Green River. Water use associated with tar sand mining and processing would come from the Upper Colorado River Basin causing small, unnoticeable changes in flow and salinity.

Development of the STSA would cause a population increase ranging from 25 to 50 percent in the area of influence, as much as 500 percent for the most heavily impacted communities. Significant pressures would be placed on housing, other infrastructures, local government finances, and changes in social structures and lifestyle. At the same time, the area would benefit from growth in employment, income, business, and improvements in the infrastructure and tax base.

Tar sand development would disturb 35,945 acres of soils and vegetation with 6,500 acres being disturbed at any one time over a 40-year period. Impacts to vegetation would also include changes in pre-project vegetation diversity and inadequate reestablishment of vegetation in low precipitation zones.

Significant impacts to wildlife include habitat destruction and displacement of animals into adjacent areas. Habitat losses could last nearly 100 years or until preconstruction forage production is achieved on the entire STSA.

Recreation opportunities in the STSA would shift from semi-primitive to semi-urban experiences. Hunting quality would diminish and a portion of the

Green River could be eliminated from any potential for Wild and Scenic River designation due to manmade structures.

Views toward the STSA from valley communities and highways to the west would be significantly and permanently adversely affected. Degradation of the visual resource would be a result of highly modifying the visually sensitive mountainous landform which serves as a background for the less dramatic foreground and middleground views from valley viewing areas.

The development of the proposed conversion areas and operation of the associated processing plants are predicted to violate criteria pollutant standards and increments. Present levels of total suspended particulates, sulfur dioxide, and nitrous oxides would be increased principally within the Sunnyside STSA.

The increase in traffic volume would reduce below an acceptable standard some road segments within the area of influence. The increase in rail tonnage within the area of influence will exceed the capacity of the Denver and Rio Grande Western railroad spur.

This EIS may result in amendments to the Price River Management Framework Plan.

EIS Contact

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Date By Which Comments on the EIS Must Be Received

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Date EIS Made Available to EPA and the Public

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PREFACE

This environmental impact statement (EIS) presents facts and projections pertaining to the proposed conversion of existing oil and gas leases within the Sunnyside Special Tar Sand Area (STSA) (Carbon County, Utah) to combined hydrocarbon leases. This EIS provides information on the proposed actions and alternatives to those actions to assist the public in becoming aware of the proposals and for use in the federal decision process.

The EIS has been prepared according to the requirements of the National Environmental Policy Act of 1969 (NEPA) and the Council on Environmental Quality's regulations for implementing NEPA, effective July 30, 1979.

Terms such as "collective" and "cumulative" impacts and "main block" are used throughout this EIS and have definitions specific to this document. Collective impacts are those impacts that would occur as a result of the proposed actions and alternatives. Cumulative impacts are those impacts that would occur as a result of the proposed actions or alternatives plus other interrelated projects planned for development in the Sunnyside STSA during the analysis period. "Main block" refers to the contiguous block of land within the Sunnyside STSA that is located in Carbon County.

This is EIS is comprised of 4 chapters and 9 appendices which include the following information.

Chapter 1—includes a description of the proposed actions and alternatives, an overview of the applicants' plans of operations, and the assumptions and analyses that this EIS is based upon. Also included is a data summary of the proposed actions and alternatives.

Chapter 2—contains a comparative analysis of the proposed actions and the alternatives.

Chapter 3—presents a description of the environment that would be affected by the applicants' proposed projects and alternatives, and the environmental consequences (impacts) that would result from implementation of the projects. The impact analyses focuses on the commercial phase of development and only those resources that would be significantly affected are discussed in detail.

Chapter 4—identifies mitigation measures, a description of the applicants' monitoring programs, and the unavoidable, adverse impacts that would occur as a result of the proposed actions. Chapter 4 also provides a perspective of the effects of implementing all the applicants' proposed projects on the long-term use of man's environment, as well as benefits and trade-offs and irreversible and irretrievable commitment of resources that would ocuur.

Appendices—The 9 appendices contain data and analysis that was used to prepare the overall analysis. The appendices, however, contain more information than is presented in the text. A list of the appendices can be found in the Table of Contents.

In addition to the 4 chapters and appendices in this EIS, there are 2 separate technical reports that support the EIS. These technical reports were prepared for air quality and socioeconomics and contain more detailed information than is presented in this EIS (including the appendices).

The technical reports can be obtained from:

Gene Nodine, District Manager Bureau of Land Management 125 West 200 South P.O. Box 970 Moab, Utah 84532	**or**	Public Room Bureau of Land Management Utah State Office 136 East South Temple Salt Lake City, Utah 84111

SUMMARY

The Sunnyside Special Tar Sand Area (STSA) has a high potential for development of tar sand resources. Additionally, the area has a wide variety of other resources and human activities that would be affected by tar sand development.

Proponents of 5 tar sand projects have filed applications with the Bureau of Land Management (BLM) to convert existing oil and gas leases within the Sunnyside STSA to combined hydrocarbon leases, in accordance with the Combined Hydrocarbon Leasing Act of 1981. Approval of the conversion applications would permit phased development of the tar sand resource. Because very little is known about the location and extent of the resource, project designs are conceptual. Therefore, should a lease be converted, additional site-specific environmental analyses would be required before the types of commercial production addressed in this environmental impact statement (EIS) would be permitted.

Tar sand development within the Sunnyside STSA would cause impacts either by displacing resources (for example, removing vegetation), using resources (for example, consuming water), or creating other changed conditions (for example, introducing visual scars on the landscape or increasing the rate of community growth). The analysis contained within this EIS focuses on these kinds of potential impacts. Resource recovery on the conversion areas would use a portion (about 70 percent) of the tar sand reserves in the main block of the Sunnyside STSA. This amount would be produced by the applicants in accordance with the proposed plans of operations. These plans estimate a lifespan of the individual projects of 20 to 55 years, with a collective total project life of 74 years. Because all the applicants have not chosen to begin production at the same time, the Sunnyside STSA would be producing bitumen for 70 of the 74 years.

AREAS OF CONTROVERSY

During the scoping process conducted through out the EIS preparation, several areas of controversy related to the proposed lease conversions were identified. Major concerns included:

- impacts to domestic water sources;
- impacts to local communities (especially Sunnyside and East Carbon);
- impacts to transportation networks;
- impacts to public access to popular recreation areas;
- impacts to recreation areas such as Bruin Point, favorite local hunting and fishing areas, and Uintah Basin recreation areas (particularly those associated with the Uintah and Ouray Indian Reservation);
- impacts to important big game habitat; and
- impacts to air quality (including impacts to the Uintah and Ouray Indian Reservation airshed).

A summary of the issues identified through the scoping process can be found in Appendix A-1, Consultation and Coordination.

MAJOR IMPACT CONCLUSIONS

The major impact conclusions concerning the development of the Sunnyside STSA conversion areas as proposed in the applicants' plans of operations are detailed in Chapter 3 of this EIS and are compared with other alternatives in Chapter 2. However, there are several major impacts associated with the proposed actions that need to be stressed. Major impacts that would be associated with development of all the applicants' proposed conversion areas considered collectively are summarized below.

Impacts due to development of each applicant's conversion area considered individually are summarized in Appendix A-2.

WATER RESOURCES

Water resources in the Sunnyside STSA would be affected primarily by surface disturbance in the

various watersheds. These disturbances would cause changes in water quality parameters, flow characteristics in surface water, and movement patterns in ground water.

Three water quality parameters are expected to increase in the main block of the Sunnyside STSA—total dissolved solids, water temperatures, and sediment levels. Flows of surface water are expected to decrease as a result of water use by the applicants, and spring flows are expected to be reduced by removal of strata that feed them. These decreases in flows would affect the 3 watersheds in the STSA as well as the Price and Green rivers.

Movement in ground water would be decreased in near-surface aquifers due to removal of strata and fracturing of the aquifer. Similarly, deep aquifers would be dewatered and, therefore, would have decreased water movement. In aggregate, these changes in the water resources system would generally degrade the quality and quantity of water in the main block of the Sunnyside STSA.

Water resources outside of the main block of the Sunnyside STSA (Price River, Green River, and Colorado River at Imperial Dam) are not expected to have great changes in flow or quality, due to the requirements for process water. Flows in the Green River would show less than a 1 percent reduction. However, the Price River would have up to a 28 percent reduction in flow. Changes in salinity would vary, with about a 1 milligram per liter (mg/l) increase or decrease in the Green River, little or no change in the Price River, and less than a 1 mg/l increase at Imperial Dam.

SOCIOECONOMICS

Development of the conversion areas would create significant, potentially adverse impacts in the short term and beneficial impacts in the long term. The direct employment of approximately 5,000 workers by 2005 would contribute to a strong regional economy in Carbon and Emery counties, but place demands on local governments, particularly in Carbon County, that would exceed their current service capacity and fiscal capability. In the long term, the revenues accruing to affected jurisdictions could provide substantial local benefits and opportunities for improving local facilities and services. While these prospects could be considered attractive by some, the short-term problems could create substantial hardships for newcomers and residents alike, due to population increase, and changes in the basic lifestyle. It is noted that although the coal industry in central Utah is currently operating at only partial capacity due largely to depressed coal markets, the recovery of coal production that is assumed in the baseline and interrelated projects would eliminate the relatively high level of unemployment that exists. Therefore, development of tar sand would create problems of crowding, community growth needs, and public service shortfalls.

SOILS AND VEGETATION

The proposed tar sand developments (including processing plants, spent sand disposal areas, and ancillary facilities) would collectively disturb approximately 35,945 acres of soils and vegetation. The total disturbance would occur over a 74-year project life and would result in 6,500 acres of disturbance at any one time, during the 40 years of steady-state operation.

In assessing significant impacts, it has been assumed that indicated erosion control, revegetation, and reclamation programs would be successfully implemented by the applicants. Even though impacts would occur to soils, through the use of the applicants' proposed reclamation procedures and the procedures that would be required by BLM, soils are generally expected to be reconstructed to pre-project productivity and stabilized.

The most significant impact to vegetation would be the change of pre-project diversity of vegetation types due to topographic changes and associated microclimate changes caused by surface mining activities. Significant impacts could occur in the spent sand disposal areas (about 3,038 acres) located in the low precipitation zones (Climatic Zones B and C, Map 3-2 map pocket), in that adequate ground cover could not be established within 5 years.

WILDLIFE

The applicants' proposed projects collectively would disturb about 35,945 acres of wildlife habitat over the life of the projects (includes construction, commercial operation, and reclamation). This is approximately 43 percent of the habitat in the STSA. The total disturbance would occur over a 74-year project life and would average, at steady-state operation, about 6,500 acres for a 40-year period. Critical deer and elk summer ranges would be affected by these disturbances, as well as habitat for birds and small mammals. Virtually all of the 16,571 acres of snowshoe hare habitat within the 35,945 acres of the main block of the STSA would be lost forever because of permanent terrain changes.

RECREATION RESOURCES

The suitability of Bruin Point for sightseeing, hunting, camping, and off-road vehicle use would be reduced significantly due to extensive surface mining activity. Recreation user access to favored dispersed recreation areas could be substantially altered. Hunting opportunities and the quality of hunting experiences would become significantly diminished. Poaching and other illegal game law violations also would be expected to increase, effecting the hunting quality. Previous semi-primitive recreational opportunities would shift generally to more semi-urban recreational opportunities because of development of the area. Diversion dam structures, pump houses, access roads, and other facilities related to development could jeopardize any potential for Wild and Scenic River designation on the Green River.

VISUAL RESOURCES

Development of the conversion areas would significantly change a majority of the acreages converted (32,695 of the total 35,945 acres disturbed), either by modifying the landform, removing vegetation for a long period of time, or by adding processing plants, utility systems, and other structures for the duration of the projects. All areas of change that can be viewed from the valley areas to the west and south would be significantly modified. These impacts would be much more critical than impacts not viewed from the valley areas, because the major landform modification would remain for an indefinite period of time and the main block of the STSA serves as a backdrop for visually sensitive valley views. Collectively, 18,932 acres of Visual Resource Management (VRM) Class II areas would be significantly affected by the projects, as would 7,268 acres of VRM Class III, and 4,050 acres of VRM Class IV. The impacts on 2,445 acres is undetermined, since it is presently unknown where the ancillary facilities would be located, and 2,500 acres would not be significantly affected.

AIR QUALITY

Air quality and visibility would be reduced through development of the proposed conversion areas and operation of the associated processing plants. Potential violations of the National Ambient Air Quality Standards (NAAQS) for total suspended particulates (TSP) and nitrogen dioxide (NO_2) are predicted. Additionally, Prevention of Significant Deterioration (PSD) Class II increments for TSP and sulfur dioxide (SO_2) could be exceeded. In general, the potential SO_2 and NO_2 violations of air quality standards and PSD increments would be localized; impacts would occur principally at nearby elevated terrain. TSP impacts would be larger in areal extent, since they would result from surface mining operations. The Sunnyside STSA would likely remain a non-attainment area (violation of NAAQS) for TSP during the majority of the mining years.

Impacts on visibility resulting from nitrogen oxide emissions are predicted to occur at the Uintah and Ouray Indian Reservation; plumes would likely be perceptible against the sky or a light background.

No perceptible visibility impacts from tar sand development are expected at any Class I or Colorado Category I areas within the air quality analysis area.

Acidic sulfur deposition resulting from the Sunnyside STSA tar sand developments would be insignificant.

TRANSPORTATION NETWORKS

Significant impacts to the roadway system and Sunnyside railroad spur would result from development of the proposed conversion areas and

operation of the associated processing plants, largely due to project-related movement of people and materials. Projected vehicle traffic during construction and rail traffic during operation would exceed existing capacities. This would result in a general slowdown of traffic and congestion of highway intersections along significantly affected road segments, the rail yard at Sunnyside, and the rail spur between Sunnyside and Mounds. The roadways in Whitmore Canyon and a portion of the road to the Kaiser mine are inadequate. Prior to granting a conditional use permit to the applicants, the county would have to upgrade these portions of their road system.

AGRICULTURE

Land disturbance associated with mining the proposed lease conversions would cause a loss of approximately 387 Animal Unit Months of forage per year, which equates to a reduction of approximately 97 head of livestock (cattle) based on a 4-month grazing season. This could have an unquantifiable but significant impact on ranchers using 12 allotments.

There would be no significant impacts to prime farm land. About 933 acres (6 percent) of the 16,617 acres of irrigated cropland in Carbon County would be converted to urban uses to accommodate the population increase caused by the 5 applicants' proposed projects.

CULTURAL RESOURCES

Impacts to cultural resources could occur from exploration, strip mining, in-situ recovery, plant construction, production transportation, off-site disposal activities, and other activities related to the construction and operation of tar sand facilities. Both surface and subsurface sites could be destroyed or damaged by such activities. If this occurred, scientific and cultural information and a portion of the resource base for future research would be lost. The loss of any information could have a significant impact on efforts to reconstruct the prehistory and history of the region.

PALEONTOLOGY AND MINERAL RESOURCES

Some paleontological resources would be lost by resource recovery operations. As a result, these resources would be precluded from study and correlation with various strata.

The proposed actions would collectively remove about 2.8 billion barrels of bitumen or about 70 percent of the resource estimated to occur in the Sunnyside STSA. The recovery of other mineral resources in the STSA would not be affected by the mining of tar sand.

WILDERNESS RESOURCES

Development of the proposed conversion areas and operation of the associated processing plants could cause secondary impacts to wilderness-related values due to air and water quality deterioration. Plumes due to the NO_x emissions associated with the proposed developments may be perceivable against the sky which could affect the visual quality for users in the northern portion of the Desolation Canyon Wilderness Study Area (WSA), Jack Canyon Appeal Area, and the Hill Creek Extension of the Uintah and Ouray Indian Reservation. An increase in sediment concentrations, and an increase in water temperature due to surface mining activity along the upper reaches of Range Creek could affect the quality of trout fishing in Range Creek, which flows through portions of the Turtle Canyon and Desolation Canyon WSAs.

MITIGATION

The impact analyses presented in this EIS assume certain types of mitigation would be implemented and would alleviate or minimize adverse impacts. These types of mitigation include:

- Mitigation measures incorporated in the applicants' proposed plans of operations. These measures are committed to by the applicants and are described in Section 1.D.2.
- Mitigation measures enforceable on lands administered by federal, state, and local agencies. These measures are committed to

by these agencies for enforcement only on lands where the respective agencies have jurisdiction. They are described in Appendix A-3.

- Additional enforceable or committed mitigation measures identified following the impact analyses that could further alleviate or minimize the environmental effects presented in Chapter 3. They are described in Chapter 4.

Additionally, uncommitted mitigation measures, which could be incorporated at a decision maker's and/or applicant's discretion, are described in Appendix A-4. However, these measures presently are not committed to by any authorizing agencies or by the applicants. Therefore, these measures were not, and should not be, considered when analyzing impacts as a result of the proposed actions or alternatives.

UNRESOLVED ISSUES

During EIS preparation, several issues were identified that would be subject to further discussion, coordination, and action. For the most part, these issues would need to be pursued outside of and independent from the EIS process if resolution were to be attained. The unresolved issues are noted here for further consideration by those involved.

The issues are related to watershed impacts, socioeconomics, threatened or endangered species, split estate (differing surface and subsurface ownership of a given area of land), unitized development of the Sunnyside tar sand resource, uncertainty regarding national prospects for a tar sand industry, and secondary road access.

WATER RESOURCES

Some lands in the proposed conversion areas have been withdrawn as water supply reserves for the town of Sunnyside and/or general public water reserves. Should conversion be approved, these lands will require special stipulations to protect water sources occurring in these areas. Any conversions which may be made on the Sunnyside water supply reserve will also require special arrangements between the potential lessee and the town of Sunnyside. These stipulations and arrangements have not been fully developed at this time.

SOCIOECONOMICS

The extent to which socioeconomic impacts could be offset as a result of actions taken under Utah law is unresolved. Utah Senate Bill 170 and the Carbon County permitting process require that developers of a major project provide socioeconomic mitigation in the form of prepayment of taxes and other advanced funding arrangements. This would be done through a process of mitigation plan preparation and approval involving project proponents, state agency representatives, and local government officials. The plan would identify the cost of providing socioeconomic services necessitated by the project, and it would contain strategies to pay for the mitigation program.

THREATENED OR ENDANGERED SPECIES

Development of the proposed conversion areas could have an effect on threatened or endangered species. However, the current project descriptions do not contain sufficient information to make a full determination as to whether or not the eventual developments would jeopardize the continued existence of any of the threatened or endangered species found in the region. This is particularily so for eventual water use from the Colorado River system and its potential effect on endangered fish species. Therefore, it would be necessary for BLM to request Consultation, per Section 7 of the Endangered Species Act, with the Fish and Wildlife Service (FWS) on a project-by-project basis as each plan of operations is reviewed for approval. Each converted lease would contain a special provision (included in Appendix A-3, Existing Oil and Gas Provisions and Required General Measures Designed to Reduce Impacts) in order to avoid a Section 7 jeopardy biological opinion.

SPLIT ESTATE

Surface and subsurface ownership within the Sunnyside STSA is extremely complex. It is not

uncommon for the federal government to have subsurface (mineral) rights to an area whose surface is privately owned, or for the federal government to have rights to only certain minerals. Any decision regarding resource recovery on a conversion area would involve consultation with the surface owner, owners of other mineral rights, BLM representatives, and the lessee or operator prior to surface disturbance or implementation of the lease rights.

UNITIZATION

Carbon County has stated that it prefers the concept of one coordinated tar sand project being developed within the Sunnyside STSA (see Appendix A-1, Figure A-1-1, for letter). A unitized approach to development might satisfy the needs and concerns of the county but cannot be required by BLM. Although all of the applicants have expressed interest in unitized development, none of the applicants have gone any further than agreeing to discuss unitization at a later date.

A unitized development alternative is analyzed in this EIS, because it is considered to be a viable alternative for tar sand development within the STSA. However, it is based on a set of BLM assumptions rather than a specific proposal by the applicants.

SYNFUELS UNCERTAINTIES

Tar sand development within the Sunnyside STSA is influenced by many complex factors, some of which are beyond the control of project proponents or agencies with authorizing actions. These factors include (1) national policies concerning synfuels as related to other energy alternatives; (2) the availability of money in the private sector and the interest shown by large financial organizations; (3) the international price of oil; and (4) the extent to which energy conservation programs are effective.

These factors result in a degree of uncertainty that very likely could continue indefinitely. Since the development of the proposed conversion areas would involve a relatively long exploration/pilot program phase and a 20- to 55-year large financial commitment during the commercial operation phase, the uncertainty would have a strong influence on decisions by the project proponents regarding the future scheduling and design of the proposed projects. Schedules and plans of operations discussed in this EIS represent the proponents' current objectives but may be revised as influenced by future events.

Synfuels uncertainties also make it difficult for local governments and others to plan services to meet the needs of project-related growth.

SECONDARY ROADS ACCESS

The existing road system on public lands within the STSA is administered under a December 1980 Memorandum of Understanding between the BLM and Carbon County. In this memorandum, the BLM and Carbon County have agreed to construct and maintain roads to meet multiple-use responsibilities and construct and maintain various county road access to public lands in Carbon County. Various private roads within the STSA are maintained and controlled by the private sector. Private ownership limits access throughout the STSA. The applicants' tar sand operations could prevent public access to public lands and ranches. A formal agreement between the applicants, BLM, and Carbon County will be required, if public access is to be maintained.

BLM-PREFERRED ALTERNATIVE

Conversion of all 23 leases with a unitized development, including mitigation identified in Chapter 4, is the Bureau of Land Management's (BLM) preferred alternative. Although this type of development must be negotiated among the lessees amd cannot be required by BLM, there is support for this alternative because it would lead to a more efficient and orderly recovery of the tar sand resource consistent with diligent and reasonable environmental protection objectives of the Combined Hydrocarbon Leasing Act. Unitized development of the Sunnyside STSA would offer these advantages: (1) the maximum amount of the Sunnyside STSA would be open for tar sand leasing; (2) lease boundary setbacks (safety zones between open pit mines) would not be required and this would allow mining continuity and more complete resource recovery; (3) only one plant site would be required;

(4) oil production, estimated for EIS purpose at 50,000 barrels per day, could be adjusted to be consistent with initial project feasibility factors for a single cooperative project; (5) total land disturbance at any one time would be at a minimum; and (6) disturbance/reclamation activities could be adjusted over time.

CHAPTER 1

DESCRIPTION OF PROPOSED ACTIONS AND ALTERNATIVES

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DESCRIPTION OF PROPOSED ACTIONS AND ALTERNATIVES

1.A INTRODUCTION

This environmental impact statement (EIS) was initiated by combined hydrocarbon lease conversion applications and proposed plans of operations filed by applicants of 5 tar sand projects—Amoco Production Company, Chevron USA Inc.-GNC Energy Corporation, Enercor, Mono Power Company, and Sabine Production Company. Each of the applicants has requested conversion of existing oil and gas leases located within the Sunnyside Special Tar Sand Area (STSA) to combined hydrocarbon leases under the Combined Hydrocarbon Leasing Act of 1981. Based on the similar filing dates of the lease conversion applications and the 15-month application processing requirements of the Combined Hydrocarbon Leasing Act, decisions on the applications are required within similar time periods. This decision time is set for April 1984.

The projects analyzed in this EIS are very conceptual. The impact analysis presented here is based on minimal data and numerous assumptions. Should a decision to convert a lease be made, additional environmental analyses based on more defined project designs would be required before the types of commercial production discussed in this EIS would be permitted. Such analyses would be done as part of the ongoing mine-plan review and monitoring program by the Bureau of Land Management (BLM).

This EIS is closely related to two other EISs that have recently been released in draft form—the Utah Combined Hydrocarbon Regional EIS (BLM 1983a), and the Tar Sand Triangle Combined Hydrocarbon Lease Conversion EIS (NPS and BLM 1983).

The purpose of the Regional EIS is to analyze the regional impacts of the proposed federal combined hydrocarbon leasing program. It also includes an analysis of potential new combined hydrocarbon lease tracts and the BLM land use planning amendments that are needed to accommodate the combined hydrocarbon leasing program. The Sunnyside STSA is 1 of 11 special tar sand areas analyzed in the Regional EIS. The reader is referred to the Regional EIS for the analysis of impacts of potential new leasing (areas not currently under combined hydrocarbon leases) within the Sunnyside STSA and impacts of amendments to the Price River Management Framework Plan (MFP). The Sunnyside Combined Hydrocarbon Lease Conversion EIS includes a detailed analysis of the combined hydrocarbon lease conversions proposed for the Sunnyside STSA and is tiered to the Regional EIS.

The purpose of the Tar Sand Triangle Combined Hydrocarbon Lease Conversion EIS is to analyze the potential impacts that would result from the proposed conversion of existing federal oil and gas leases lying within the Tar Sand Triangle STSA to combined hydrocarbon leases. The purpose, therefore, is similar to that of this EIS.

1.A.1 COMBINED HYDROCARBON LEASING ACT OF 1981

The Combined Hydrocarbon Leasing Act of 1981 (Public Law 97-78), which amends the Mineral Leasing Act of 1920, was enacted to facilitate and encourage the production of oil from tar sand and other hydrocarbon deposits. The act redefines oil to include tar sand; provides for conversion of existing federal oil and gas leases and certain valid mining claims to combined hydrocarbon leases on areas identified as special tar sand areas; and provides for issuance, on a competitive basis, of new combined hydrocarbon leases within special tar sand areas.

The Combined Hydrocarbon Leasing Act and associated regulations are pertinent to this EIS, because they permit lessees holding valid oil and gas leases within designated special tar sand areas to convert their leases to combined hydrocarbon leases if regulatory and environmental compliance provisions are met. A combined hydrocarbon lease would convey the rights to all hydrocarbons located on the lease except coal, oil shale, and gilsonite. The lease conversion decision must be based upon a

plan of operations submitted by the lessee/operator for development of the tar sand resource. If the leases are converted, a new lease is issued for an additional 10-year term to allow development of the tar sand resource. If the leases are not converted, they remain as valid oil and gas leases until the original lease term has elapsed. Under the conversion regulations (43 CFR 3140), a decision on a conversion application must be made within 15 months of receipt of a completed plan of operations.

The 5 applicants whose plans of operations are assessed in this EIS held valid oil and gas leases within the Sunnyside STSA when their plans of operations were filed with BLM during November and December 1982. The terms of 18 leases containing 25,462 acres have been suspended pending the processing of the lease conversion applications, because the initial terms of the leases have passed. Should the leases not be converted, the applicants would lose these leases. The terms of the other 5 leases containing 3,339 acres proposed for conversion have not been completed and could be extended beyond the normal termination date by timely drilling under the oil and gas regulations.

The Combined Hydrocarbon Leasing Act requires that conversion applicants file a complete, proposed plan of operations which assures reasonable protection of the environment and diligent development of the hydrocarbon (tar sand) resource. According to the conversion regulations (47 CFR 3140-2-3), the plan may include an exploration phase, but shall include a development phase. A plan of operations can be approved even though it may indicate work under the exploration phase is necessary to perfect the proposed plan for the development phase, as long as the overall plan demonstrates reasonable protection of the environment and diligent development of the hydrocarbon resource.

A plan of operations may be modified or amended before or after conversion of a lease (or valid mining claim) to reflect changes in technology, slippages in schedule beyond the control of the lessee, new information about the resource or the economic or environmental aspects of its development, changes to or initiation of applicable unit agreements, or for other purposes. Significant changes to a plan of operations must be approved by the BLM, at which time other governmental agencies and the public would have the opportunity to comment. These changes may initiate the updating and supplementation of original environmental documents.

1.A.2 PURPOSE AND NEED FOR PROPOSED ACTIONS

The purpose of each of the proposed conversions is to allow exploration and, ultimately, development of the tar sand resource. Following lease conversion and prior to development, additional environmental analyses, permit approvals, and additional NEPA compliance may be required by federal regulatory agencies. State and local agencies who may also require additional studies, permits, or approvals. The need for each conversion is related to the national demand for petroleum products and the national goal to reduce dependence on foreign oil sources as set forth in the Energy Security Act (Public Law 96-294).

The Energy Security Act was passed "...to utilize to the fullest extent the constitutional powers of the Congress to improve the Nation's balance of payments, reduce the threat of economic destruction from oil supply interruptions and increase the Nation's security by reducing its dependence on imported oil" (42 U.S.C. Section 8701(b)(1). Congress found that these purposes can be served, among other ways, by: (1) demonstrating at the earliest feasible time the practicality of commercial production of synthetic fuels from domestic resources employing the widest diversity of feasible technologies; (2) fostering the creation of commercial synthetic fuel production facilities of diverse types with the aggregate capability to produce from domestic resources in an environmentally acceptable manner the equivalent of at least 500,000 barrels of crude oil per day by 1987 and at least 2 million barrels of crude oil per day by 1992; (3) encouraging private capital investment and activities in the development of domestic sources of synthetic fuel and fostering competition in the development of the nation's synthetic fuel resources; and, (4) fostering greater energy security in reducing the nation's economic vulnerability to disruptions in imported energy supplies.

In recent years, domestic production of petroleum products has not kept pace with domestic demand.

The Energy Information Administration's 1981 Annual Report to Congress shows that supply and demand have increased over levels established in the 1970s, but that the imports rather than the domestic supply have been making up the difference (Table 1-1). (The Energy Information Administration's 1983 report considers total hydrocarbon supply and does not present specific data for petroleum derived from shale, tar sand, and synthetics. The Administration's 1981 projections for synfuels are the most recent.) Mid-range projections for 1985, 1990, and 1995 show that domestic demand is expected to drop from the 1979 level, as will imports and total supply. Imports are expected to remain at almost 25 percent of demand by 1995. As in the past, long-term demand usually is expected to be greater than production.

The combined full production capacity of the 5 tar sand projects assessed in this EIS would be approximately 115,000 barrels per day (bpd) by 1998 (Table 1-2). This would be 29 percent of the mid-range domestic synthetic production estimate for 1995.

TABLE 1-1
SUMMARY OF PETROLEUM SUPPLY/DEMAND BALANCE
(Million Barrels per Day)

	History				Mid-Range Projections		
	1965	**1973**	**1979**	**1980**	**1985**	**1990**	**1995**
Domestic Supply	9.2	11.3	10.9	10.8	9.7	10.1	10.9
Shale, Tar Sand and Synthetics	0	0	0	0	0.3	0.3	0.4
Net Imports	2.2	6.1	8.0	6.2	6.9	5.6	5.0
Total Supply[a]	11.4	17.4	18.0	16.9	16.6	15.7	15.9
Total Domestic Demand	11.5	17.3	18.9	17.0	16.6	15.7	15.9
Percent of Total Supply which is Shale, Tar Sand and Synthetics	0	0	0	0	1.81	1.91	2.52

Source: Energy Information Administration 1981.

[a]Numbers are rounded and, therefore, may not add up exactly.

TABLE 1-2
SUMMARY OF PROPOSED ACTIONS

	Amoco	Chevron-GNC	Enercor	Mono	Sabine
Production (bpd)	50,000	10,000	20,000	30,000	5,000
Target Date for Full Production	1998	1997	1991	1990	1989
Product Life (years)	30[a]	30	20	33	55
Proposed Conversion (acres)	9,602.08	160.00	1,962.67	9,836.13	7,240.04
Mine Type	open pit	open pit	open pit	open pit	None
Process Type	solvent or retort	cold water flotation/ solvent extraction	hot water	solvent extraction	in-situ
Upgrading Type	None[b]	coking/ hydro-treating	coking/ hydro-treating	coking/ hydro-treating	None[b]

Note: bpd = barrels per day.
[a]Amoco has stated commercial operation life would be 20 years plus. For analysis purposes, a life of 30 years was assumed.
[b]No on-site upgrading is proposed in plan of operations. Crude product to be transported to existing refinery for upgrading.

Development of any of the proposed conversion areas would contribute to the maturation of the synfuels industry through application of present technology on a commercial scale.

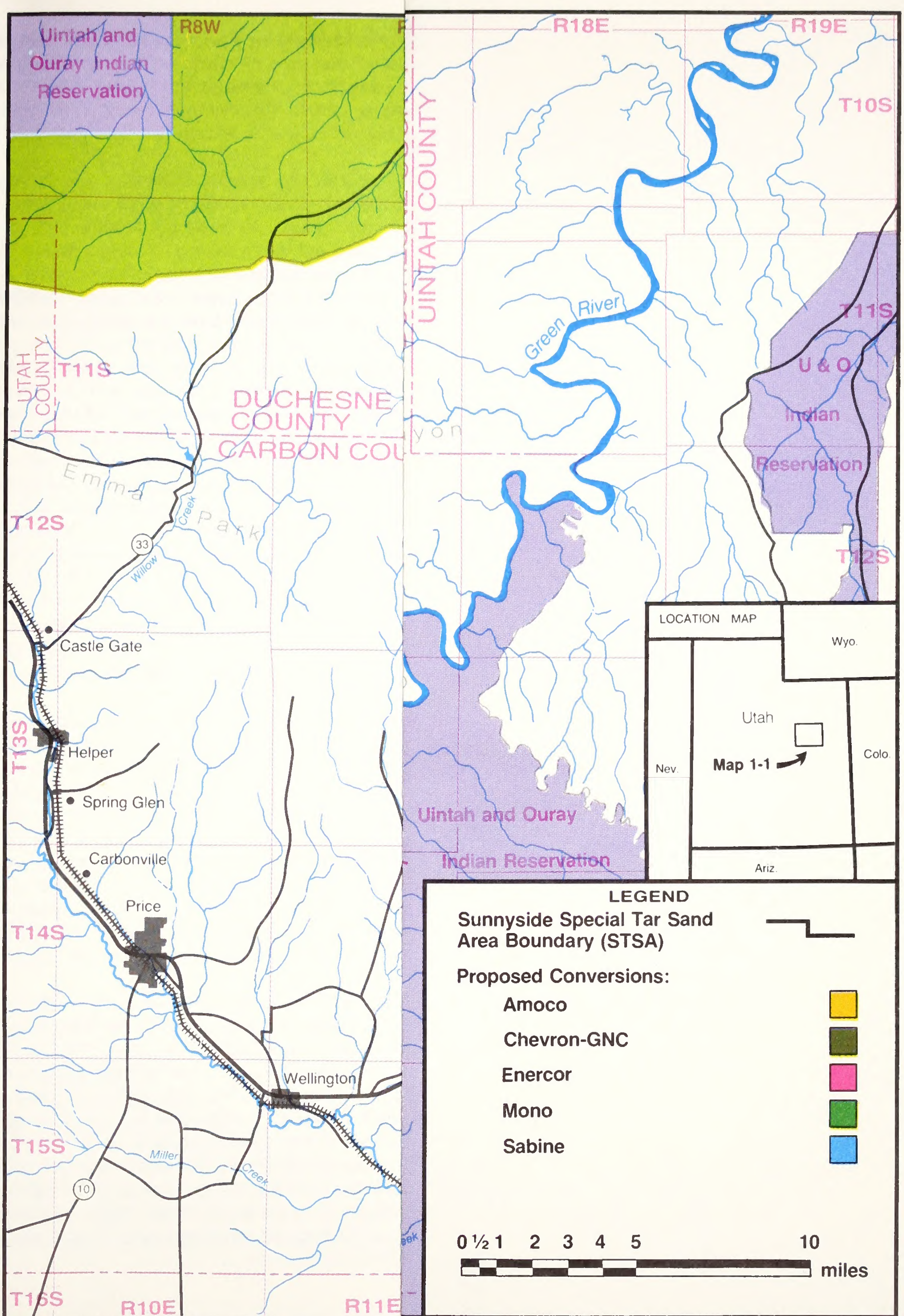
1.A.3 LOCATION OF PROPOSED ACTIONS

The leases proposed for conversion that are considered in this EIS are located within the 157,445-acre Sunnyside STSA (Map 1-1). The Sunnyside STSA is located within northeastern Carbon and southern Duchesne counties, Utah, and the BLM Moab and Vernal Districts (Price River and Diamond Mountain Resource Areas). All of the proposed conversion areas analyzed in this EIS are located in Carbon County in the "main block" of the STSA as identified on Map 1-1. No lease conversions are proposed in the scattered tracts of the STSA located to the north and east of the "main block."

1.A.4 AUTHORIZING ACTIONS

After completion of the EIS process, two types of actions may result—decisions on the adequacy and acceptability of the proposed plans of operations and/or decisions on the lease conversion applications.

The basic action would be a decision on conversion, partial conversion and/or special mitigation, or denial of conversion of each of the 23 leases under application. In situations where all or part of existing leases include sensitive resource areas and would only be partially suited for conversion, the lease would be converted in its entirety with sensitive areas protected by special stipulations, assuming



D HYDROCARBON LEASE CONVERSIONS

that reasonable protection of the environment is assured through stipulations. In areas where the Secretary of the Interior determines that reasonable protection of the environment will not be assured, all or portions of the leases may not be converted.

As a step in the lease conversion process, the BLM would approve the plan of operations for each lease or for each applicant's group of leases. However, approval of a plan of operations for the purposes of conversion of an existing oil and gas lease to a combined hydrocarbon lease would authorize only those actions that are described in sufficient detail in the plan to allow the BLM to analyze them fully. Such approval would stipulate those actions for which the lessee would be required to submit additional information for analysis prior to authorization of further development. Such stipulations may be included in the lease, or the approval letter may identify later phases of the plan of operations which are approved for the purpose of conversion but which will require additional information for analysis before on-the-ground activity is authorized. The plan of operations must contain enough information, as determined by the BLM, to assure diligent development of those resources requiring enhanced recovery methods of development or mining and reasonable protection of the environment.

With specific reference to the lease conversion applications for the Sunnyside area, approval of an applicant's plan of operations may be considered for the exploration and pilot plant phases provided that site-specific field clearances are satisfactory; however, because sufficient details are not available to adequately prepare full-scale mining operation plans, step-by-step mining plan approval may be necessary as the resource is explored, thereby allowing full-scale mining plans to be developed on mineable segments of the leases.

Under the conversion regulations (47 CFR 3140.4-2), a combined hydrocarbon lease will contain all appropriate terms and conditions required to ensure compliance with the plan of operations, including . any necessary stipulations that were part of the original oil and gas lease being converted. General provisions of an oil and gas lease that likely would be carried forward should a lease be converted are identified in Appendix A-3. Compliance with these provisions is assumed in the analysis of impacts of the applicants' proposed plans of operations.

All leases would be accompanied by stipulations requiring compliance with all valid and applicable laws and regulations of federal, state, and local governmental authorities. Each respective lease conversion applicant would be responsible for obtaining such other authorizations and permits. Examples of these types of federal authorizations and permits include those related to the Archaeological Resources Protection Act, Water Pollution Act, and the Clean Air Act. General measures that would be required for some federal authorizations are listed in Appendix A-3.

1.A.5 INTERRELATIONSHIPS

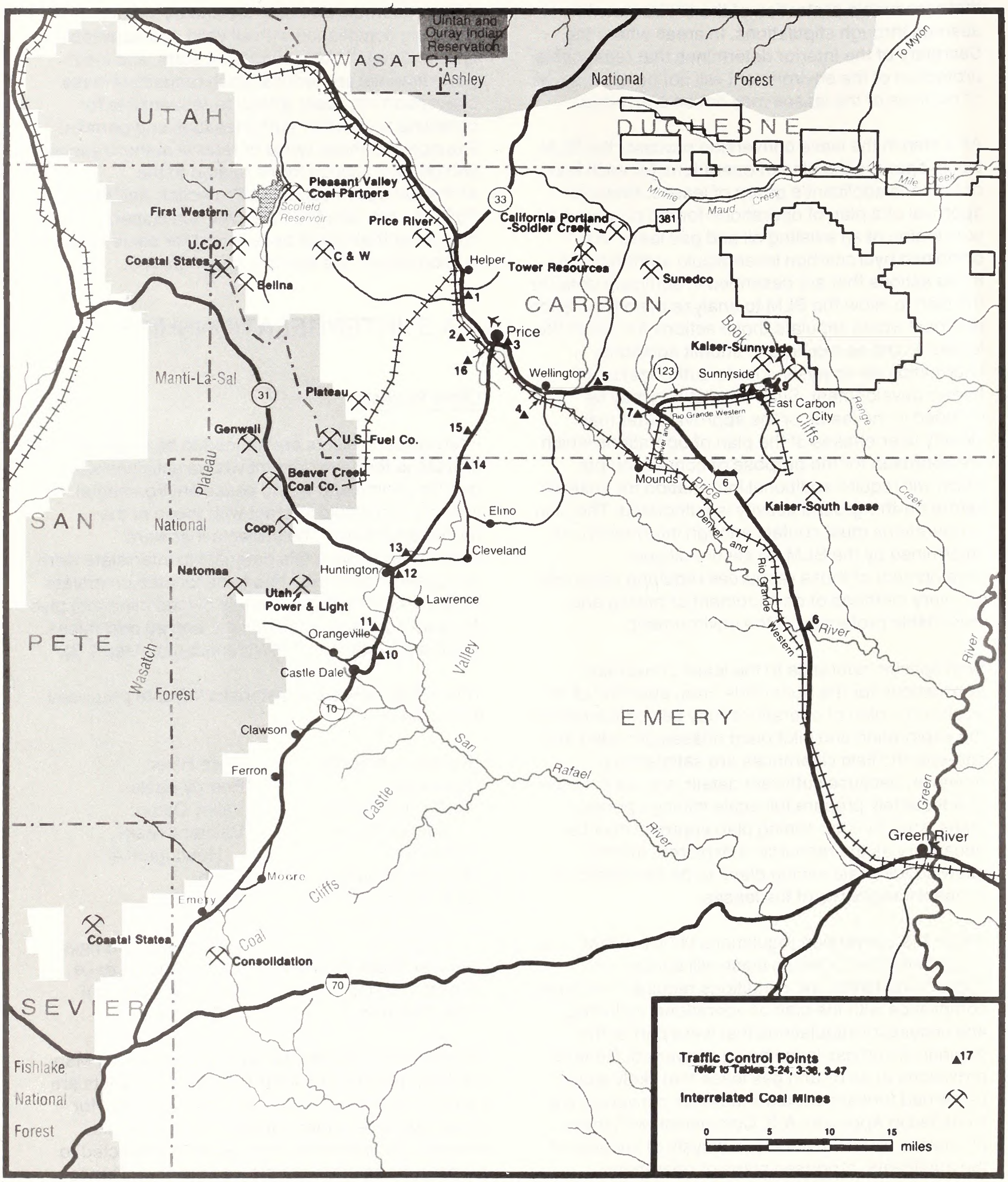
<u>Other Projects</u>

Interrelated projects are defined to be projects with firm plans for development whose activities would overlap in time and would cause environmental impacts that would interact with those of the proposed actions. The projects that were determined to have this potential to interrelate were the Chevron tar sand mine to be located on private land within the STSA (privately owned minerals) plus its associated processing plant, and 20 coal mines located outside the STSA (identified on Map 1-3).

Those coal mines are (asterisks indicate proposed new mines):

Kaiser-Sunnyside
*Sundeco
California Portland-Soldier Creek
Plateau
Tower Resources
U.S. Fuels
*Pleasant Valley Coal Partners
Beaver Creek Gordon
Coastal States
*First Western
Price River
*Energy Fuels
Valley Camp
*Beaver Creek-Huntington 4
Coop
*Genwall
Natomas
Utah Power and Light
*Kaiser-South Lease
Consolidation Coal Company

The locations of these projects are shown on Map 1-2 (map pocket) and Map 1- 3. These projects are considered in the cumulative impact analysis for those resources where project impacts would interact. The interrelated projects are expected to primarily bring more people into the area. Due to



MAP 1-3 COAL MINES CONSIDERED AS INTERRELATED PROJECTS AND TRANSPORTATION NETWORKS

this, the transportation networks, local government (socioeconomics), and recreation base are the resources that would be affected.

Within the Sunnyside STSA, several companies (including several conversion applicants considered in this EIS) have tar sand mineral rights to areas sufficiently large to permit development. However, since no firm plans for independent development of these areas have been proposed, their development is considered to be too speculative or conceptual for them to be considered as interrelated projects in this EIS.

The Chevron-GNC development on private land is planned to consist of a typical open pit mine and a cold water flotation/solvent extraction processing plant (with coking and hydrotreating facilities) capable of producing 10,000 bpd of synfuel. Chevron Resources Company recently acquired 51 percent of the GNC project and have applied to the Synthetic Fuels Corporation for assistance in developing the projects.

The mine would be located in Sections 3, 4, and 10, T14S, R14E, and would cover about 1,400 acres. The plant and spent sand disposal area would be located southwest of the town of Sunnyside and cover about 1,300 acres. (See Map 1-2 (map pocket) for exact location.) About 2,900 acres (including ancillary facilities) would be disturbed over the 30-year life of the project.

Special Management Areas

Two types of special management areas are found within the area that would be affected by the applicants' proposed plans of operations. These are special watershed management areas and areas being considered for wilderness suitability. The management restrictions associated with the 4 potentially affected special watershed management areas (a water supply reserve, a public water reserve, and 2 BLM-designated watersheds) are discussed in Section 3.A.1, Water Resources. The restrictions that apply to the 2 potentially affected wilderness study areas (Turtle Canyon and Desolation Canyon) and the Jack Canyon Appeal Area are discussed in Section 3.A.12, Wilderness Resources.

1.B OVERVIEW OF PROPOSED ACTIONS AND ALTERNATIVES

1.B.1 GENERAL DESCRIPTION

This EIS considers the proposed actions of the 5 lease conversion applicants (considered collectively) and 3 alternatives—partial conversion and/or special mitigation (Note: for ease of reference in text, tables, and maps, the name of this alternative is hereafter shortened to read "partial conversion alternative". However, the reader should be aware that it also describes conversion with special mitigation to attain essentially the same environmental protection), unitized development, and no action. Table 1-3 summarizes the general characteristics of the collective proposed actions and the alternatives.

Under the proposed actions, all existing oil and gas lease tracts within the Sunnyside STSA identified by the applicants would be converted. The analysis of the impacts that would result from tar sand recovery in the conversion areas and subsequent processing is based on the project components and operation parameters identified in the applicants' proposed plans of operations and BLM assumptions required to analyze some of the more conceptual aspects of these plans.

Under the partial conversion alternative, only portions of the tracts identified by the applicants would be converted. The analysis of impacts that would result from tar sand recovery and subsequent processing is based on BLM assumptions about the number and type of project components and operation parameters. This alternative was derived by BLM in order to provide information on an intermediate leasing alternative. It does not represent the applicants' views of potential project modifications, nor does it reflect any consideration of possible economic factors.

TABLE 1-3
OVERVIEW OF PROPOSED ACTIONS AND ALTERNATIVES

	PROPOSED ACTIONS	ALTERNATIVES		
		Partial Conversion	Unitized Development	No Action
Proposed Conversion Areas Included	All	Some	All	None[c]
Conversion Related Processing Plants[a] (number)	5+2[b]	2	1	None[c]
Total Conversion-Related Synfuel Production	115,000 bpd[d]	80,000 bpd	50,000 bpd	None[c]
Project Life[e]	74 years	49 years	94 years	NA

Note: bpd = barrels per day; NA = not applicable.

[a]Number of plants proposed/assumed to process conversion-related tar sand.

[b]Each applicant has proposed 1 main plant. In addition, Mono has proposed 2 secondary mill sites.

[c]Because it is assumed that no conversion areas would be developed, there would be no conversion-related processing plants or synfuel production. However, it is assumed that Chevron's interrelated project (mine and plant) would be developed regardless of whether the conversion applications were denied. This project would produce 10,000 bpd over a 30-year period.

[d]The total production of the applicants may be somewhat less, due to boundary restrictions.

[e]The project life for the individual companies ranges from 20 to 55 years; the number of years from the start of the first project until the end of the last project is shown.

Under the unitized development alternative, all lease tracts identified by the applicants would be converted. However, the analysis of impacts that would result from tar sand recovery and subsequent processing is based on BLM assumptions about how a unitized development operation could proceed.

Under the no action alternative, no lease tracts identified by the applicants would be converted. The impact analysis of this alternative assumes that all interrelated projects identified in Section 1.A.5, Interrelationships, would be developed as currently envisioned.

1.B.2 LAND STATUS AND OWNERSHIP

The proposed actions would occur in an area where surface and subsurface land ownership is complex. The federal government retains the tar sand rights to all the proposed conversion areas. However, the

federal government does not necessarily have surface rights or other mineral rights to these areas. In many cases, there is a split estate—private parties own the land surface and the federal government retains only some of the mineral rights. The distribution of federal and private surface ownership on the proposed conversion areas is identified on Table 1-4. The relationship between the surface and subsurface ownership of the land is shown on Map 1-4 (map pocket).

sections that follow discuss, in general terms, the phased development of tar sand resources. They do not necessarily accurately describe the actual approach that would be used for any individual applicant's conversion area, but they provide useful background information. More specific details pertinent to an individual applicant's plan of operations are identified in Section 1.C.2, Applicants' Plans of Operations, and Appendix A-2, Summary of Applicants' Plans of Operations and Impacts.

TABLE 1-4
SURFACE OWNERSHIP OF LEASES PROPOSED FOR CONVERSION
(acres)

PROPOSED CONVERSION AREA	SURFACE OWNERSHIP Federal	Private[a]	TOTAL AREA
Amoco	7,602.08	2,000.00	9,602.08
Chevron-GNC	160.00	0	160.00
Enercor	852.48	1,110.19	1,962.67
Mono	5,320.13	4,516.00	9,836.13
Sabine	6,200.04	1,040.00	7,240.04
Total	20,134.73	8,666.19	28,800.92

Note: Surface ownership is displayed graphically on Map 1-4 (map pocket).
[a]Private surface estate over the federal mineral estate proposed for conversion.

1.C PROPOSED ACTIONS

1.C.1 GENERAL PLAN OF OPERATIONS

The Combined Hydrocarbon Leasing Act requires that conversion applicants file a complete proposed plan of operations that asssures reasonable protection of the environment and diligent development of the hydrocarbon resource requiring enhanced recovery methods (tar sand). The general requirements of a plan of operations are identified in the Code of Federal Regulations (30 CFR 231.10).

Some aspects of the plans submitted by the applicants considered in this EIS are similar. The

Exploration

The purpose of the exploration phase would be to determine the quantity and quality of tar sand ore underlying the conversion areas. For all applicants, the exploration phase would be critical to the design of their plans for commercial development, because existing oil and gas leases did not permit exploration for tar sand. Therefore, current reserve estimates are speculative. Until reserve estimates are better defined, project plans can be only conceptual.

During the exploration phase, typical activities would include collection of geological, geophysical, hydrological, and geochemical data through field surveys, core hole drilling, and similar procedures. Typically, one or two field seasons would be

required to collect the necessary data to proceed to the test mine and pilot plant phase.

Test Mine and Pilot Plant

The purpose of the test mine and pilot plant phase would be to obtain the data necessary to develop final engineering design for a commercial level of development. Typically, small amounts of ore would be mined from a primary target area located within the proposed area to be mined. This ore would serve as feedstock for a small (50 to 250 bpd) pilot plant, typically located in an urban area (not necessarily the Sunnyside-Price area) with the necessary delivery systems for power, water, and materials needed for processing.

Based on test runs, processing parameters would be established and final designs for a scaled-up processing plant would be developed. This phase would continue for 4 to 5 years.

Commercial Development

A commercial-level tar sand development within the Sunnyside area would consist of either a surface mine or in-situ extraction facilities plus a processing plant and spent sand disposal area (in the case of a surface-mine-related facility) and related ancillary facilities such as water pipelines, power lines, and product pipelines. Since in-situ extraction is proposed only by Sabine, it is not discussed in general terms in this section. The reader should refer to the discussion of Sabine's plan of operations located in Section 1.C.2, Applicants' Plans of Operations, for information about this resource recovery method.

Commercial Surface Mine

Surface mining methods would be the most likely method of tar sand recovery in roughly the western two-thirds of the main block of the Sunnyside STSA, where the tar sand seams are anticipated to occur at a depth of 600 to 800 feet and to be approximately 400 to 500 feet thick.

Mine excavation, including construction staging and mining start-up, would be expected to run parallel with processing plant construction. Initially, access and haulage roads would be built, the site would be prepared, and ancillary facilities, such as those needed for power and water supplies, would be installed, and a pit or working area would be developed.

A typical scenario for development of a commercial mine developed from the 4 surface mining proposals in hand is described below.

Initially, mining could start at the outcropping of the tar sand. In areas where the ore seams occur on flat or rolling land, mining could resemble conventional contour mining. Mining would occur on horizontal benches. Alternatively, where the seams outcrop in steeply eroded canyons, the final pit slopes and working pit slopes would be determined by the characteristics of the rock and the terrain.

Since much of the area proposed for mining consists of high ridges and narrow canyons, overburden could be placed in the canyons, as shown in Figure 1-1. Alternatively, in some areas, after the first or second cut, overburden could be blasted so that about one-third is thrown into the adjacent open cut. Next, dozers would push another third of the overburden into the adjacent open cut; and the lower third would be loaded into trucks and hauled back and dumped into the second cut, as shown in Figure 1-2. This method would require bringing the trucks up a fairly steep grade, but it would leave the third cut open for easy ore removal. The original contour would not be restored upon the completion of mining.

Initial mining would result in the development of spoil piles outside of the mine operating parameter no matter which mining method is used. Depending on the size of the operation and the configuration of the ore and waste horizons, a large amount of material equivalent to several years production would be placed in canyon fills.

A tar sand mining operation would utilize methods and employ a variety of equipment typical of any large surface mining operation. These could include drills, shovels, draglines, graders, endloaders, haul trucks, crushers, conveyors, and support equipment.

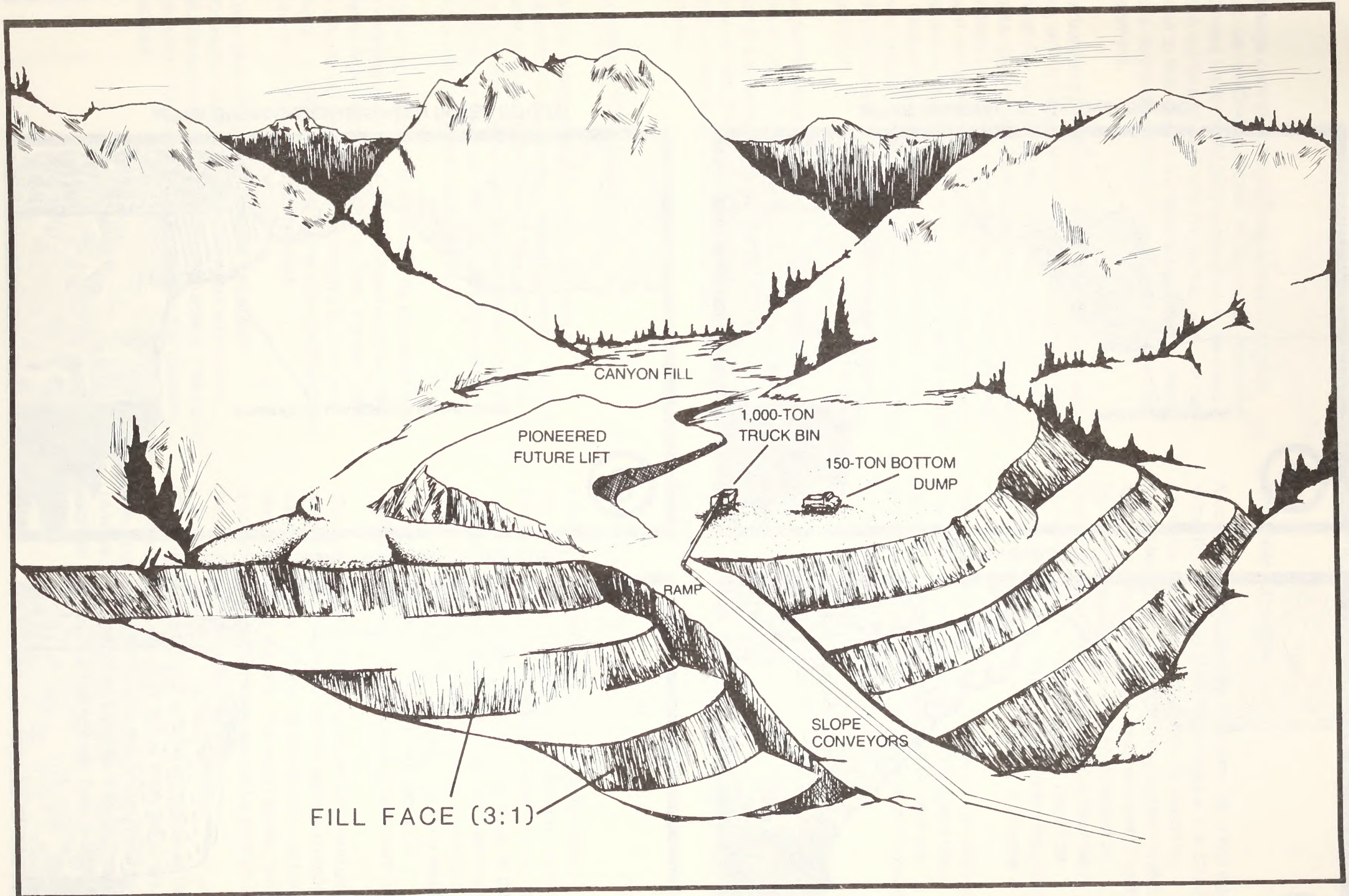


FIGURE 1-1 TYPICAL CANYON FILL OVERBURDEN OR SPENT SAND DISPOSAL SITE

Artists Conception: BLM

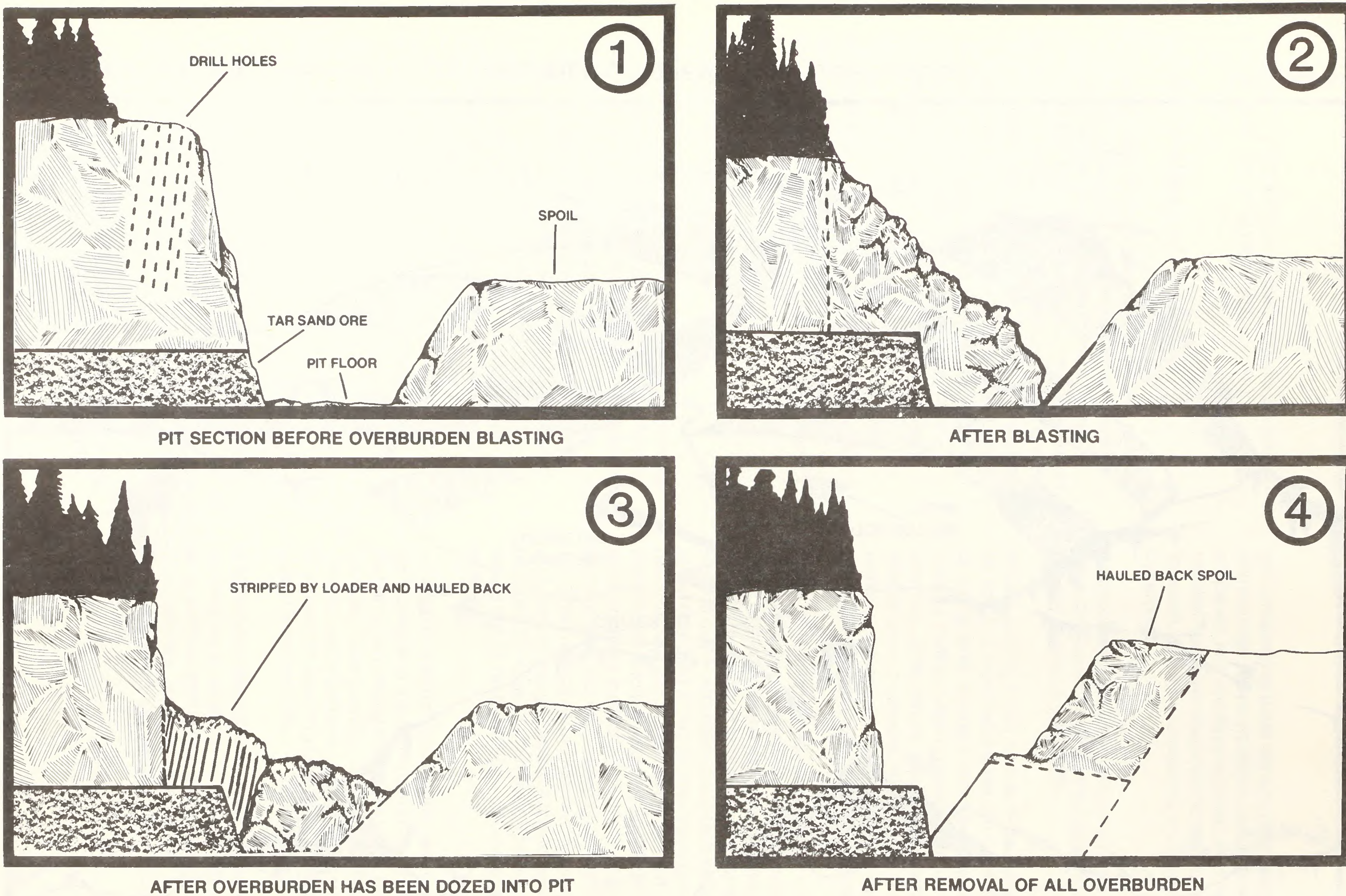


FIGURE 1-2 TYPICAL MINING SEQUENCE

Drainage control during mining is important and could be handled as shown in Figure 1-3. A dugout sediment basin could be constructed on the solid bench surface. Runoff and pit discharge would be routed to this basin via a rock-filled drainage ditch that is dug in the mine pit floor prior to overburden placement.

Overburden spoil dumps, and ultimately the mined area, would be reclaimed. Final reclamation of the canyon fills would consist of finish grading of the slopes, sealing of the pile surfaces, and establishing drainage control on the surfaces. The final grading would make the fills blend into the undisturbed land adjacent to the piles. In the Sunnyside area, it would be necesary to create a reclamation surface with gentle slopes to prevent excessive erosion from rain and snowmelt and to obtain a satisfactory growth of vegetation.

The general overall reclamation process would include topsoil removal, spoil regrading, general dozing, topsoil spreading, revegetation, and land management. (Refer to Appendix A-7 for a more detailed discussion of reclamation and erosion control.)

Commercial Processing Plant

The ultimate goal of the proposed plans of operations would be to produce synthetic crude oil that is acceptable as refinery feedstock. To achieve this goal, it would be necessary to extract the raw bitumen from the host material and upgrade the bitumen to the desired specifications.

In general, run-of-mine ore would be delivered to a processing plant via an overland conveyor or other system from the tar sand mine. Then the ore would be moved via feeders and conveyors to crushers where it would be reduced to the size specifications required for the extraction process.

Three general types of tar sand extraction processes could be used—hot water extraction, solvent extraction, and thermal extraction. The basic characteristics of each are outlined in the following sections.

Hot Water Extraction

A conceptual process flow scheme for a hot water extraction process is shown in Figure 1-4. During hot water processing, crushed ore would be processed in closed conditioning vessels with hot recycle water containing a small amount of soda ash. In these vessels, the bitumen would be separated from the sand, creating a bitumen-sand-water slurry. The slurry then would be processed in an air flotation cell where the bitumen would be separated from the sand and water.

The water would be separated from the clean sand in a spiral classifier-thickener circuit and then recycled. The spent sand would be sent via conveyor or pipeline to the spent sand disposal area or tailings pond for disposal.

The crude bitumen produced in flotation would be further cleaned of sand and water in a mixer-settler and distillation system.

Typically, a hot water extraction process would remove 95 percent (by weight) of the bitumen from the tar sand ore.

Solvent Extraction

A conceptual process flow scheme for solvent extraction is shown in Figure 1-5. Using a solvent extraction process, crushed tar sand ore would be contacted with a solvent to dissolve most of the bitumen in the sand. After dissolution, relatively bitumen-free coarse sand would be separated from fine sand and would be sent to a washing step. The bitumen-solvent/fine-sand slurry would be transferred to a fine sand washing and removal step.

The coarse sand would be washed concurrently with fresh solvent to remove the remaining bitumen. Sand and solvent would be separated and the sand dried to recover solvent. The wash liquor, containing a small amount of bitumen, would be sent to the fine sand removal and washing step.

The bitumen-solvent/fine-sand slurry would be contacted with the wash slurry from the coarse sand washing step. Fine sand in the liquid would be removed by settling, and the sand would be dried to recover the solvent. The solvent then would be

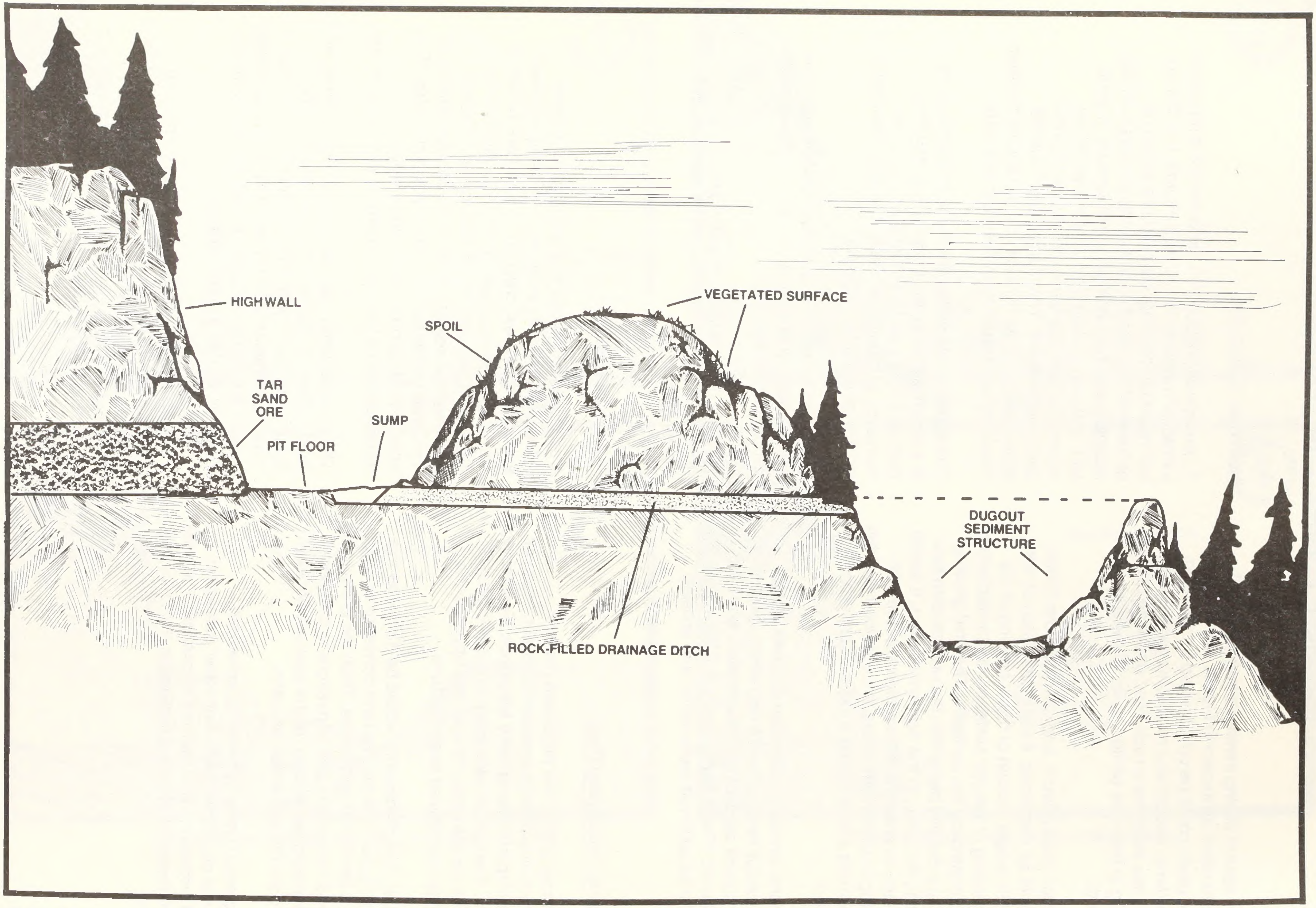


FIGURE 1-3 TYPICAL SURFACE MINE DRAINAGE CONTROL

Artists Conception: BLM

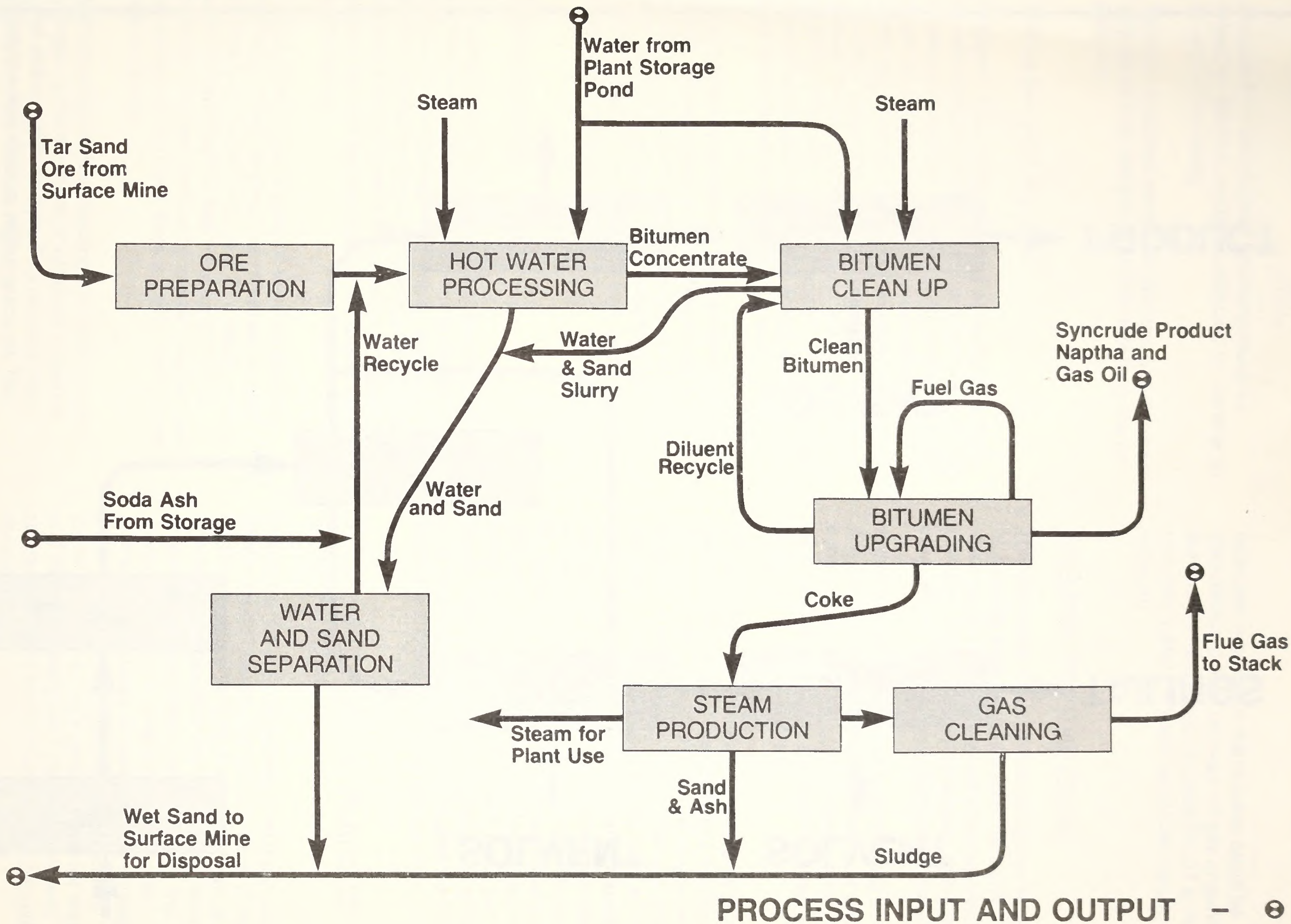


FIGURE 1-4 HOT WATER EXTRACTION PROCESS AND UPGRADING SYSTEM

Source: Enercor

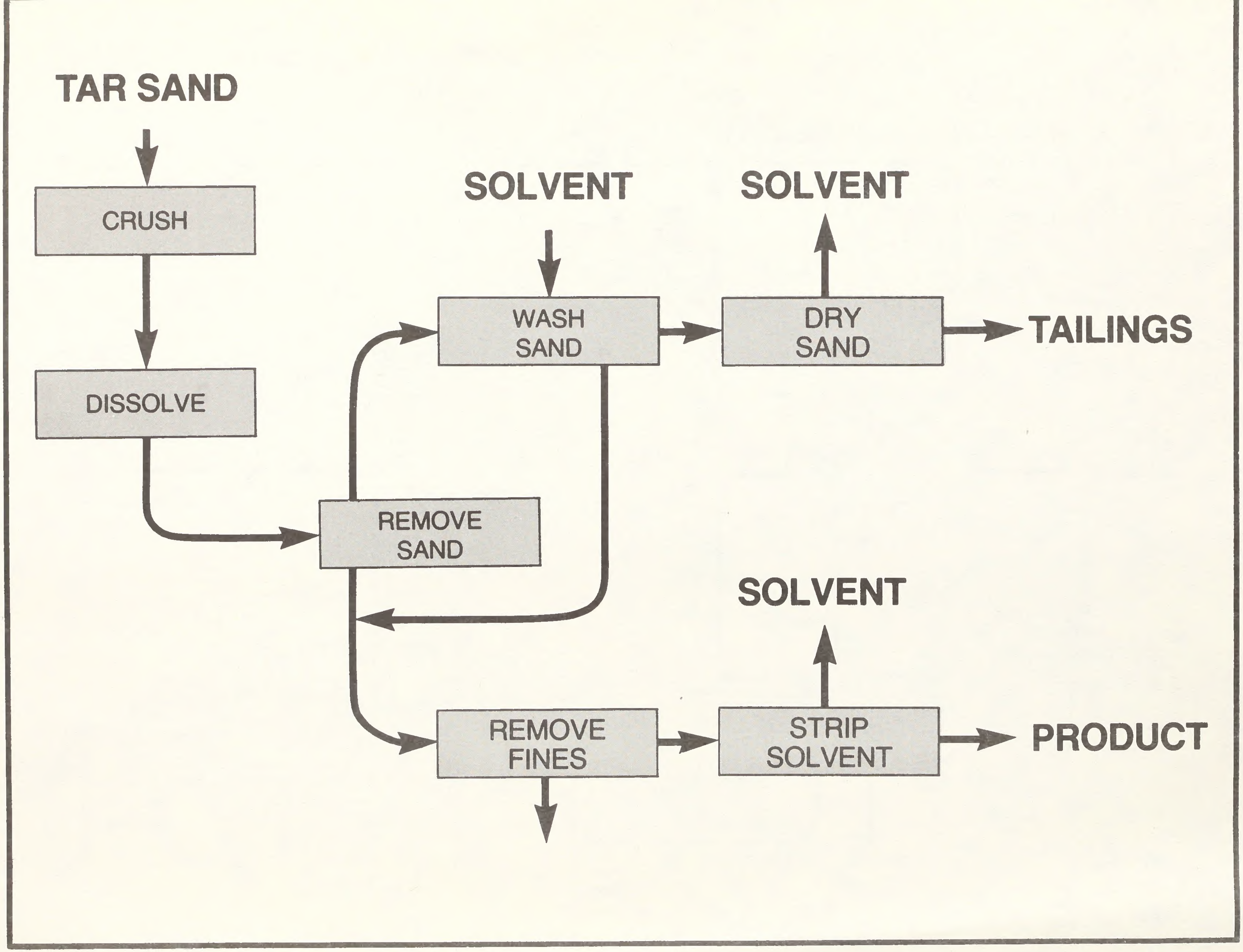


FIGURE 1-5 SOLVENT EXTRACTION PROCESS

Source: Amoco Production Co.

stripped from the bitumen and condensed for recycling. Bitumen would be collected for transfer to an upgrading facility.

Typically, a solvent extraction process would extract 95.5 percent (by weight) of the bitumen from the tar sand ore.

Thermal Extraction Process

Research is currently underway to explore methods for recovering bitumen by high-temperature retorting techniques. Although more difficult processing steps would be required and close control would be necessary, thermal recovery of bitumen would avoid the use of water and/or solvent required for near-ambient recovery processes, and would bypass handling of the very viscous bitumen. This extraction process also could require less energy than the hot water and solvent extraction processes.

When subjected to elevated temperatures, bitumen distills, cracks to form volatile compounds, and condenses to form coke and raw tar sand oil. The coke can then be burned to provide heat for retorting. Figure 1-6 is a typical flow diagram of a thermal extraction process.

Bitumen Upgrading

The purpose of bitumen upgrading is to convert the bitumen to a synthetic crude oil that is readily suitable for processing in existing refineries and to improve its transportation properties. Crude bitumen extracted through one of the previously described processes could be upgraded through coking and/or hydrotreating.

Coking involves heating the oil to about 900°F to 980°F and then charging it into a vessel in which thermal decomposition occurs. As a result, coke is removed, resulting in a less viscous and higher grade oil. The gas produced could be used as plant fuel along with the coke. Excess coke, if any, could be sold as fuel.

Hydrotreating involves reacting the crude oil with hydrogen in the presence of catalysts to reduce sulfur and nitrogen content. This process also results in a less viscous, higher grade oil. The hydrogen needed for the process could be manufactured from process off-gas or purchased in the form of natural gas. A Claus/SCOT sulfur recovery system typically would be used for sulfur removal.

Spent Sand Handling and Disposal

The main solid waste stream produced by a processing plant would be spent tar sand. The spent sand would be either trucked or transported via a conveyor from the processing plant to the disposal area, where it would be subsequently reclaimed.

In the Sunnyside area, spent sand could be disposed of either in a canyon, valley, or plain. The construction and final configuration of the pile would vary depending on where it was disposed, as shown in Figures 1-1, 1-7, and 1-8.

Depending on the extraction process used, the spent sand could contain between 0.5 percent and 5 percent of the original bitumen as unrecovered material, approximately 10 to 15 percent moisture, the original silica sand that was present in the ore and, in some cases, possibly a trace of soda ash or solvent. If a hot water extraction process were used, a small amount of air pollution control scrubber sludge would be mixed with the spent sand prior to disposal. The sludge is expected to contain two-thirds fine sand (by weight), which originated from the tar sand ore; the remaining third would be sodium bisulfate and sulfite produced from sulfur dioxide scrubbing with soda ash solution.

1.C.2 APPLICANTS' PLANS OF OPERATIONS

In accordance with requirements of the Combined Hydrocarbon Leasing Act of 1981, each of the applicants has submitted a proposed plan of operations for development of the lease tracts proposed for conversion. As required by the regulations (43 CFR 3140.2-3(f)), each plan addresses all phases of development. However, in general, the plans include relatively detailed exploration plans, more general plans for test mine and pilot processing plant development, and conceptual plans for commercial mine and plant development.

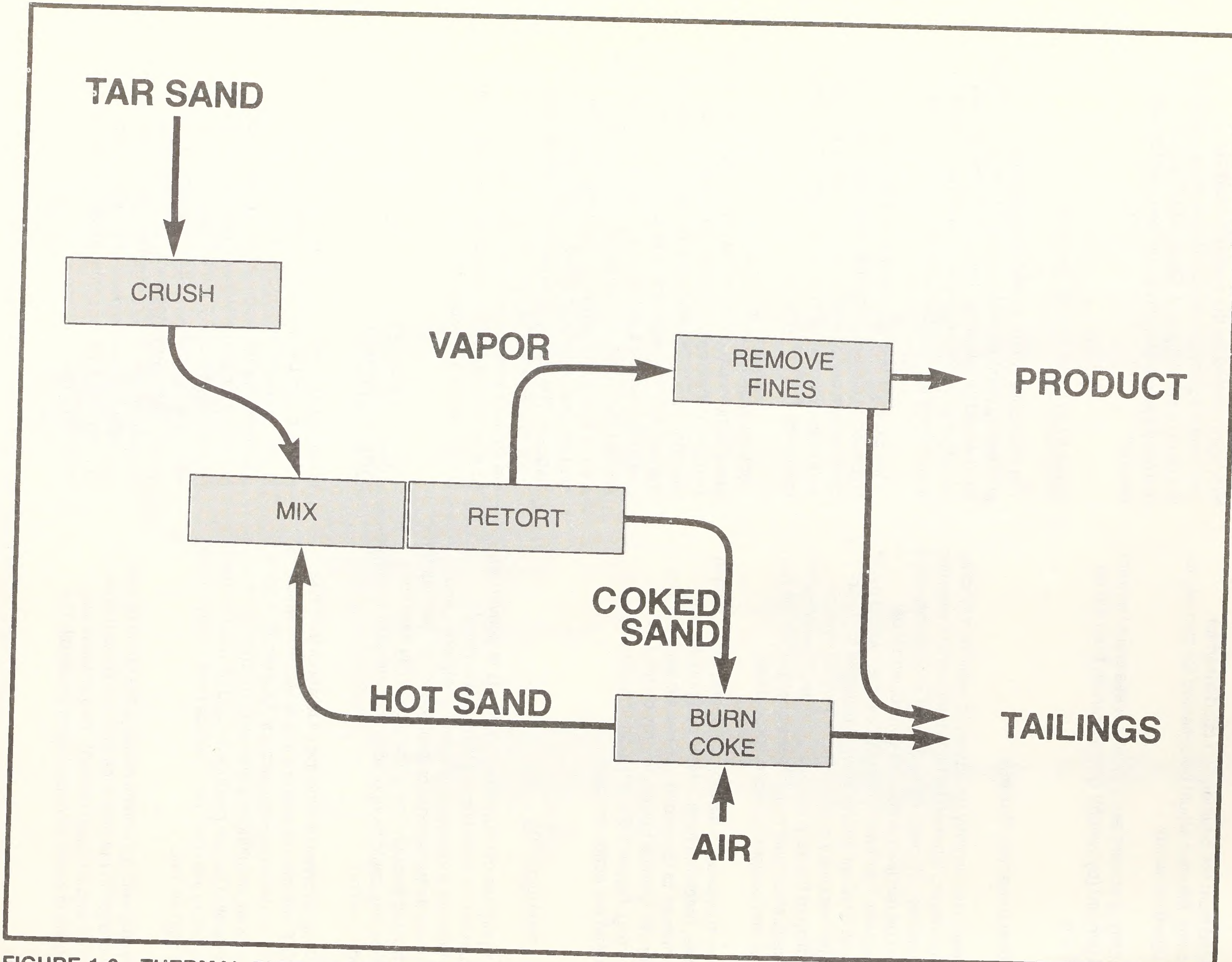
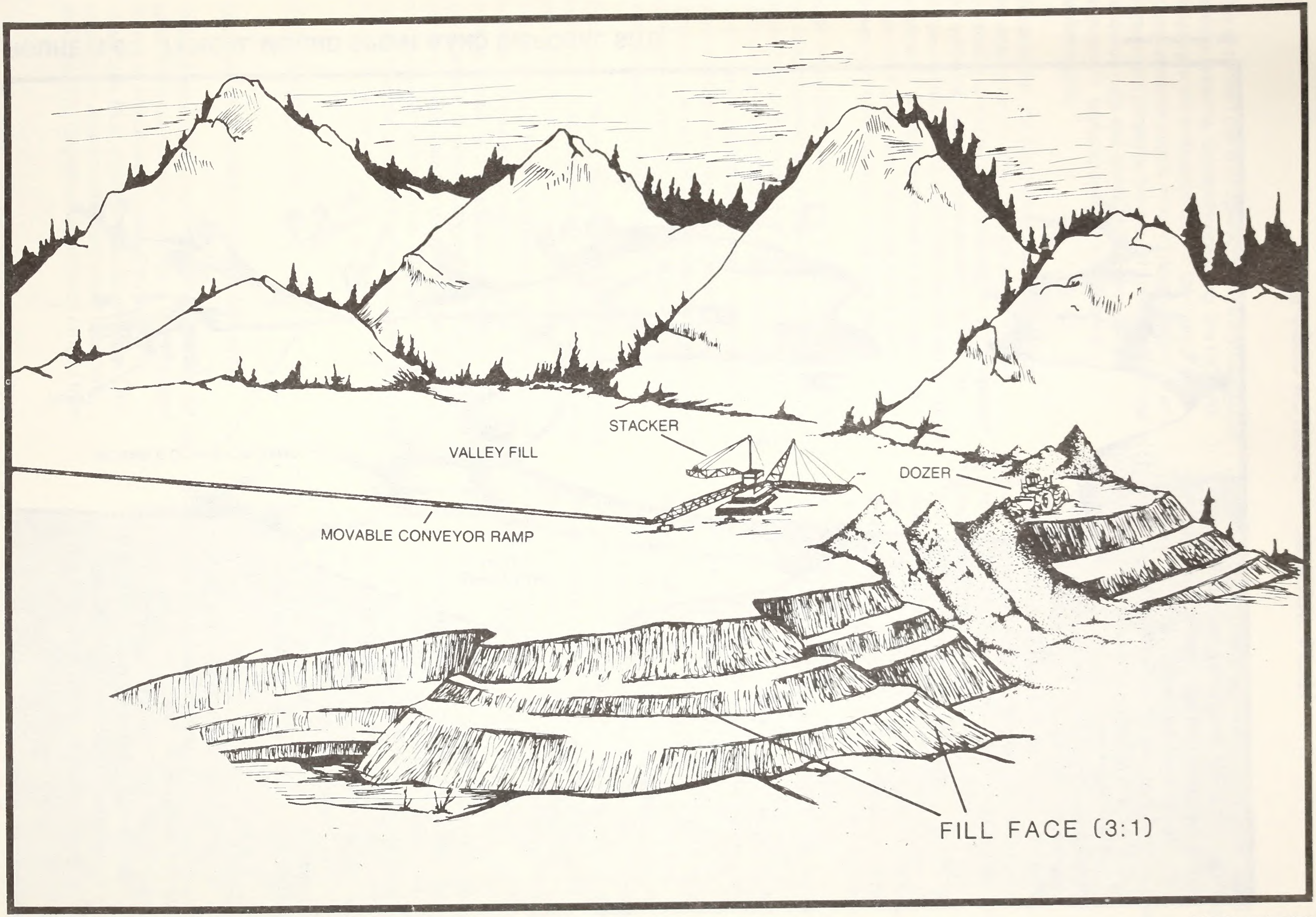


FIGURE 1-6 THERMAL EXTRACTION PROCESS

Source: Amoco Production Co.



Artists Conception: BLM

FIGURE 1-7 TYPICAL VALLEY FILL SPENT SAND DISPOSAL SITE

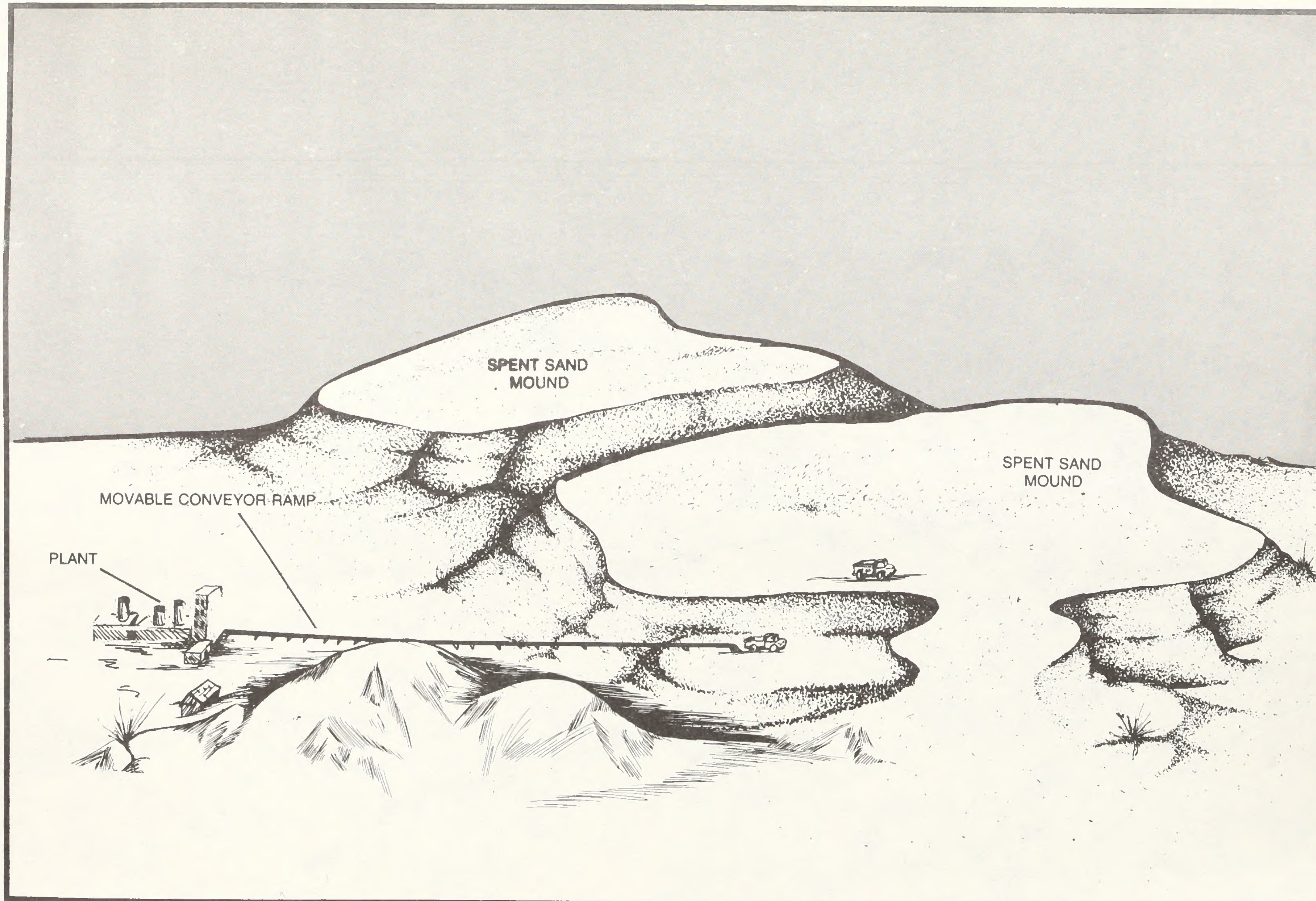


FIGURE 1-8 TYPICAL MOUND SPENT SAND DISPOSAL SITE

Artists Conception: BLM

The proposed plans of operations are conceptual for several reasons. Generally speaking, the tar sand industry is still in its infancy, and the industry has many research needs. Prior to development of any commercial projects, the industry needs additional resource data and research on processing techniques, and pilot testing of promising technologies.

In particular, the Sunnyside lease conversion applicants have limited data on which to base estimates of the tar sand reserves on the proposed conversions, because their existing oil and gas leases did not permit exploration for tar sand. For all applicants, present estimates of the location and extent of the tar sand reserves on the conversion areas are based on limited drill core data.

Until the quality, extent, and location of the available tar sand reserves are more clearly defined, it is not possible to prepare detailed plans for pilot and commercial levels of development. Similarly, until mine location, mining sequence, and processing plant locations are determined with greater accuracy, it is not possible to determine site-specific corridors for ancillary facilities such as power lines, water pipelines, and product pipelines.

Because of these unknowns, it is necessary to make assumptions for aspects of the commercial tar sand operations that were not clearly defined in the plan of operations. These assumptions are necessary in order to analyze the proposed plans for purposes of making decisions on the lease conversion applications. In general, the assumptions were designed to provide the decision maker with a worst-case impact analysis. The assumptions concerning the proposed actions are outlined in the following section.

Analysis Assumptions

Land Disturbance Within a Conversion Area

Several applicants proposing surface mining did not specify how all acreage included in the proposed leases to be converted would be developed. Therefore, BLM assumed that all portions of the conversion area would be disturbed to varying degrees. The degree of disturbance ranged from open pit mining, and vegetation removal, to travel ways with crushed vegetation. Areas of steep slopes and gullies were excluded from totals when they were considered unmineable, because of topographic constraints or if the resource had been eroded away. This is in accordance with 43 CFR 4140.1-4(d) (2), "a plan of operations that is designed to serve as the application for a number of leases proposed to be operated as a unit shall explain how and when each lease included in the unit operation will be developed." In instances where such explanation was unclear or did not fully explain the purpose of including lands in the proposed unit, a worst-case analysis of surface disturbance was used. Therefore, the figures used represent the maximum possible land disturbance. This assumption required that estimates of area required for spent sand disposal had to be increased somewhat over what was identified in the proposed plans. Assuming that all portions of a lease would be disturbed allows for more of the resource to be mined. Due to this, the applicants' total production levels were increased, not on a barrels per day basis, but by extending the project life of their proposals. This assumption did not greatly affect the impact analysis nor did it increase the acres disturbed at any one time. The individual project lives range from 20 to 55 years; however, they do not all begin on the same year. Due to this, tar sand mining operations can be expected to have an on-going project life of 74 years. The specific production-related assumptions that were made for each of the applicants are listed below.

- Amoco's plan of operations identified the actions that would be taken on about one-third of the area proposed for conversion (about 3,000 acres). For analysis purposes, however, BLM assumed the entire area proposed for conversion (approximately 9,600 acres) could be disturbed. The additional spent sand that could be generated based on this assumption was assumed to be disposed in a mined-out area.

- Mono's plan of operations identified the actions that would be taken on about one-half of the area proposed for conversion (about 4,500 acres). For analysis purposes, however, BLM assumed the entire area proposed for conversion (approximately 9,800 acres) could be disturbed. The additional spent sand that

could be generated based on this assumption was assumed to be disposed in a new pile adjacent to the pile identified in the applicant's proposed plan of operations.

- The other applicants identified the activities that would occur on the majority of the area to be converted, so BLM did not make any assumptions concerning the area to be disturbed. Chevron-GNC identified activities that would occur on 155 of the 160 acres proposed for conversion; Enercor identified activities that would occur on 1,500 of the approximately 1,900 acres proposed for conversion; and Sabine identified activities that would occur on 6,000 of the approximately 7,200 acres proposed for conversion.

Tables 1-11 and 1-12 in Section 1.H, Data Summary, summarize the potential amount of land disturbance identified in the applicants' plans of operations and the amount of land disturbance assumed by BLM in the EIS analysis.

Reclamation and Land Disturbance at One Time

Because the applicants' reclamation plans are conceptual at this time, a uniform set of assumptions was made for all applicants. For surface mining operations, it was assumed that reclamation would occur in stages concurrent with mining operations. For the in-situ operation, it was assumed that reclamation would occur in stages with the advancement of the wellfield. The general reclamation sequence assumed is illustrated in Figure 1-9.

Calculations of land disturbance at one time were based on a determination of the amount of land that would be out of productive use during steady-state, commercial-level operations. Establishment of sufficient understory vegetation (mainly grasses and forbs) to provide soil stability, erosion control, and initial livestock grazing is assumed to require 4 years. Longer periods of time would be required for shrubs and trees to recover to effective wildlife habitat or near preconstruction conditions as discussed in Section 3.A.3, Soils and Vegetation. Therefore, for the proposed actions considered collectively, the acres disturbed at one time was assumed to be about 6,500 at a steady state operation for 40 years. The different start dates and project lengths of the 5 projects were considered in determining these figures.

Ancillary Facilities

The applicants have identified locations of ancillary facilities only in very general terms (for example, water would be piped from the Green River to the plant site; bitumen would be piped to Salt Lake City). Therefore, average distances from point of origin to destination and average widths of disturbance for construction have been assumed for the major ancillary facilities (access roads, power lines, water pipelines, and product pipelines).

It should be noted that none of the applicants have requested rights-of-way for any ancillary facilities at this time. Should an applicant's conversion application be approved, and when project design is more clearly defined and specific rights-of-way applications are filed, additional environmental analyses would be required by BLM prior to making a decision on those rights-of-way applications.

The following sections summarize each applicant's plan of operations, as currently proposed and analyzed in this EIS. Specific project description data is summarized in tabular form in Appendix A-2, Summary of Applicants' Plans of Operations and Impacts.

Amoco

Amoco Production Company (Amoco) plans to convert 7 leases totaling 9,602.08 acres. Their locations are shown on Map 1-2 (map pocket).

Amoco's proposed plan of operations (Amoco 1982) identifies a 7-phase program for commercial production of bitumen from tar sand ore on their Sunnyside leases as follows:

- Process development
- Exploration
- Pilot plant
- Test mine with access road
- Test mine and pilot plant studies

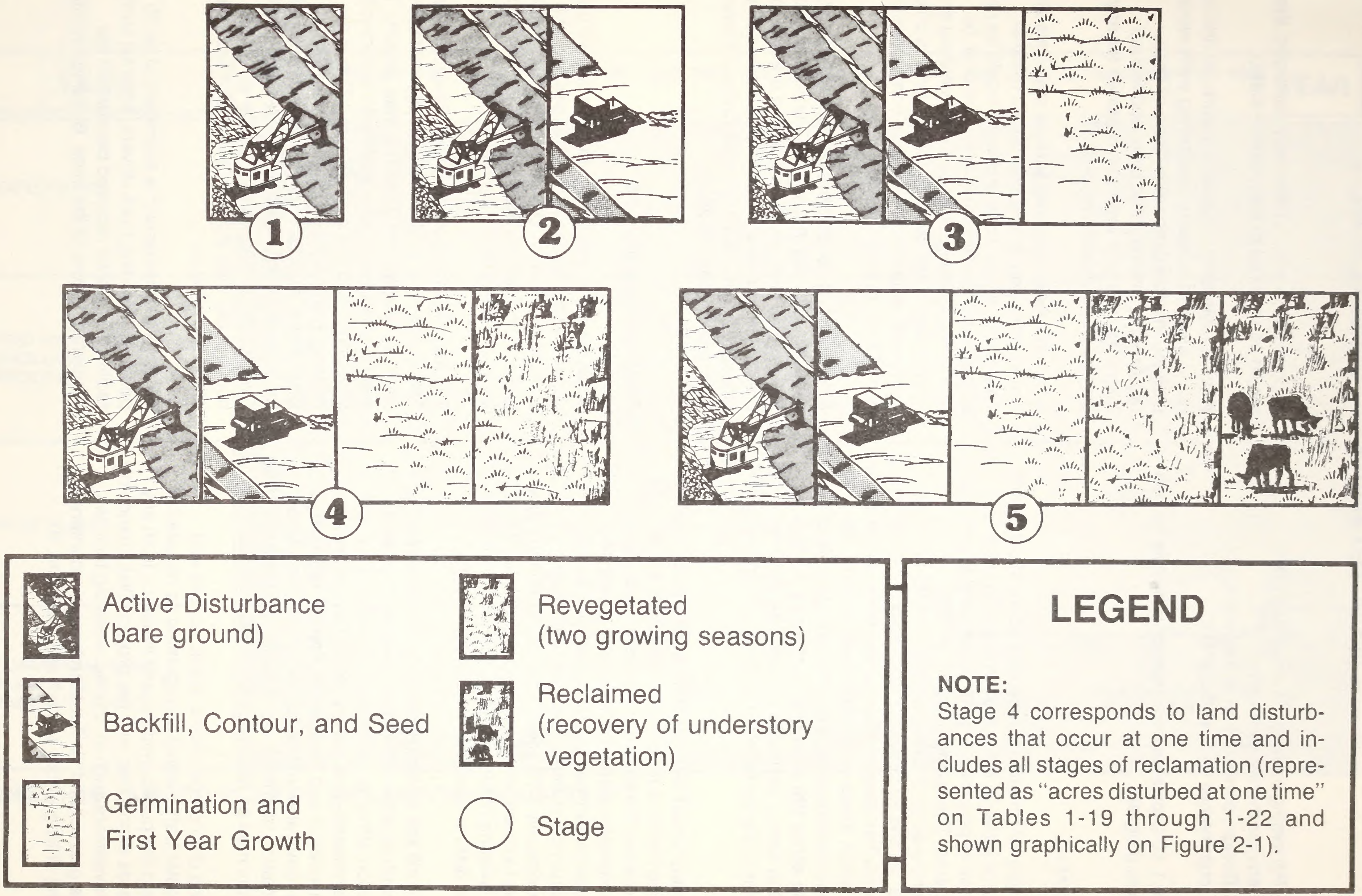


FIGURE 1-9 ASSUMED RECLAMATION SEQUENCE

include a small maintenance shop and storehouse/ office building.

The pilot plant is conceptually designed to be a nominal 150 bpd unit and to be in operation in paying quantities by mid-1993. It could be located near the town of Wellington, Utah, or more likely, outside the Sunnyside-Price area. General requirements of the plant would be:

- staff of 60 to 70 people
- 10 to 15 acres of land
- 50,000 gallons of water per day (55 ac-ft/yr)
- proximity to population center
- proximity to railroad facilities
- 350 kilowatt (kW) of power

Tar sand ore would be transported to the pilot plant via truck to Wellington or to a rail siding for shipment elsewhere, depending on where the plant would be located. In all probability, product from the pilot plant would be transported by rail or tank truck to be used as feedstock for a refinery in the Salt Lake City area.

Pilot plant operation would continue for approximately 1 year after the mid-1993 startup. During this period, the process concepts would be demonstrated, mechanical equipment reliability would be assessed, and data would be collected for the design and economic evaluation of a commercial-scale facility. Assuming the project was viable, as much as 6 years could elapse from the time the pilot plant shut down in 1994 and the first commercial module came on stream. This time period includes 2 years for the preparation of an engineering design and 4 years of actual construction.

Commercial Development

After completion of the 10-year program outlined in the previous section, further process development could be necessary. On this basis, the pilot plant would be revamped to incorporate the changes deemed necessary to demonstrate the technical and economic viability of the process. The pilot mine also would have to be reactivated to provide feed for the operation.

It may be possible that while a full-scale commercial unit could not be justified at the end of the development program, the pilot plant could be economic. In this case, the pilot mine could be reopened to keep the process facility operating.

The final process has not been selected. It could be either a solvent extraction or thermal extraction (retort) method similar to those described in Section 1.C.1, Processing. On-site upgrading is not planned. The commercial processing plant would be located in Section 35, T135, R14E, as shown on Map 1-2 (map pocket).

A typical mining method would be used such as one described in Section 1.C.1, General Plan of Operations. Spent sand would be placed in the mined out pit or disposed of with the overburden.

Bitumen from the recovery process would be shipped by tank car or pipeline to an upgrading facility located off-site. The two most likely locations for such a facility are Amoco refineries in Texas City, Texas, and Salt Lake City, Utah.

Ancillary facilities would consist of access roads, a water pipeline, power lines, and a product pipeline.

Additional Environmental Protection Measures

Permitting activities for the access road and pilot mine and plant would begin in 1990. Baseline environmental monitoring for a commercial facility would begin at the same time. Prior to this, Amoco would meet with Utah's Resource Development Coordinating Committee and the BLM to familiarize these agencies with their planned development and to fully coordinate their activities with all interested state and federal regulatory and conservation agencies.

During the period of 1983 to 1990, Amoco would review the project plans with all interested parties while addressing in detail specific concerns relating to environmental aspects of their development. For example, a partial hydrologic field program could be implemented during the test mine operations. Information obtained from the test holes now in place, from a stream flow station, and from water quality sampling would assist in the design of this program. As presently conceived, this pilot program could be expanded to cover the affected commercial project area. Surface water parameters to be

assessed include stream flow, sediment loads, runoff, and water quality. Water level, flow rates, and water quality could be determined for ground water. The test mine hydrology field program would be expanded depending upon data needs.

Amoco also would define more fully the chemical and physical characteristics of the mine waste and process waste. This information would be used in formulating wastewater treatment measures, protection measures for ground water against possible leachate contamination, and appropriate reclamation techniques. Also, appropriate air and water monitoring programs would be initiated.

Chevron-GNC

Chevron-GNC Energy Corporation (Chevron-GNC) proposes to convert 1 lease totaling 160 acres (Map 1-2, map pocket). As identified in Chevron-GNC's proposed plan of operations (Chevron-GNC 1982), the tract would be mined and its ore processed by a cold water flotation/solvent extraction plant (with coking and hydrotreating facilities) capable of producing 10,000 bpd of synfuel.

Chevron's plan of operations proposes a 3-stage development program— exploration, pilot plant and test mine, and commercial development. A general schedule is shown in Figure 1-11.

Exploration

In order to evaluate the tar sand deposits, 3 core holes would be drilled within the conversion area. Access to the drill sites would be gained by constructing road spurs from the existing primitive road which transects the northeast corner of the conversion area.

The drill sites would be prepared by leveling the ground to allow stable drilling, removing unconsolidated material (dirt) to the side of the area, and keeping material lost down slope to a minimum consistent with good engineering practice. Less than 0.25 acres would be disturbed for each drill site.

Access roads to the 3 drill sites would total approximately 1,400 feet. Road locations have been selected on the basis of topographic map information. Where possible, roads have been aligned with ridge lines to avoid the creation of drainage channels and subsequent erosion caused by roads intercepting natural drainages.

The roads would be constructed to a nominal width of 16 feet with the material removed from the roadbed retained on the outside edges of the road to form safety berms and to control erosion. Water bars would be installed at reasonable intervals.

Roads in use during exploration would be maintained by blading as necessary. Roads that no longer would be needed for the exploration or mining phases of the project would be reclaimed.

Roads and drill sites would be reclaimed by spreading the surface material removed during drill site and road construction over the disturbed areas to provide a medium for plant development. The regraded drill sites and roads would be seeded and mulched to establish a plant cover.

Test Mine

Mining would occur in 2 phases. Because the tar sand of interest outcrops on the conversion area, mining would be conducted in several small areas to allow tar sand of different grades and sand layers to be mined for processing. For the first phase, 4 employees at the mine would produce up to 40 tons of ore per day, mining up to 80 tons of rock, up to half of which would be overburden. This ore would be hauled by truck over the existing roads, improved to accommodate traffic, to a pilot plant located south of the town of Sunnyside. The second phase would proceed as the first, but with tonnages increased.

Commercial Mine

The conversion area would be mined as a typical open pit mine. Access to the mine would be by a haul road from Chevron's interrelated mine on private land. The initial section of the ridge face to be mined and the areas designated for spoiling waste rock would be cleared of all trees and brush. Topsoil material would be removed and stored for reclamation use.

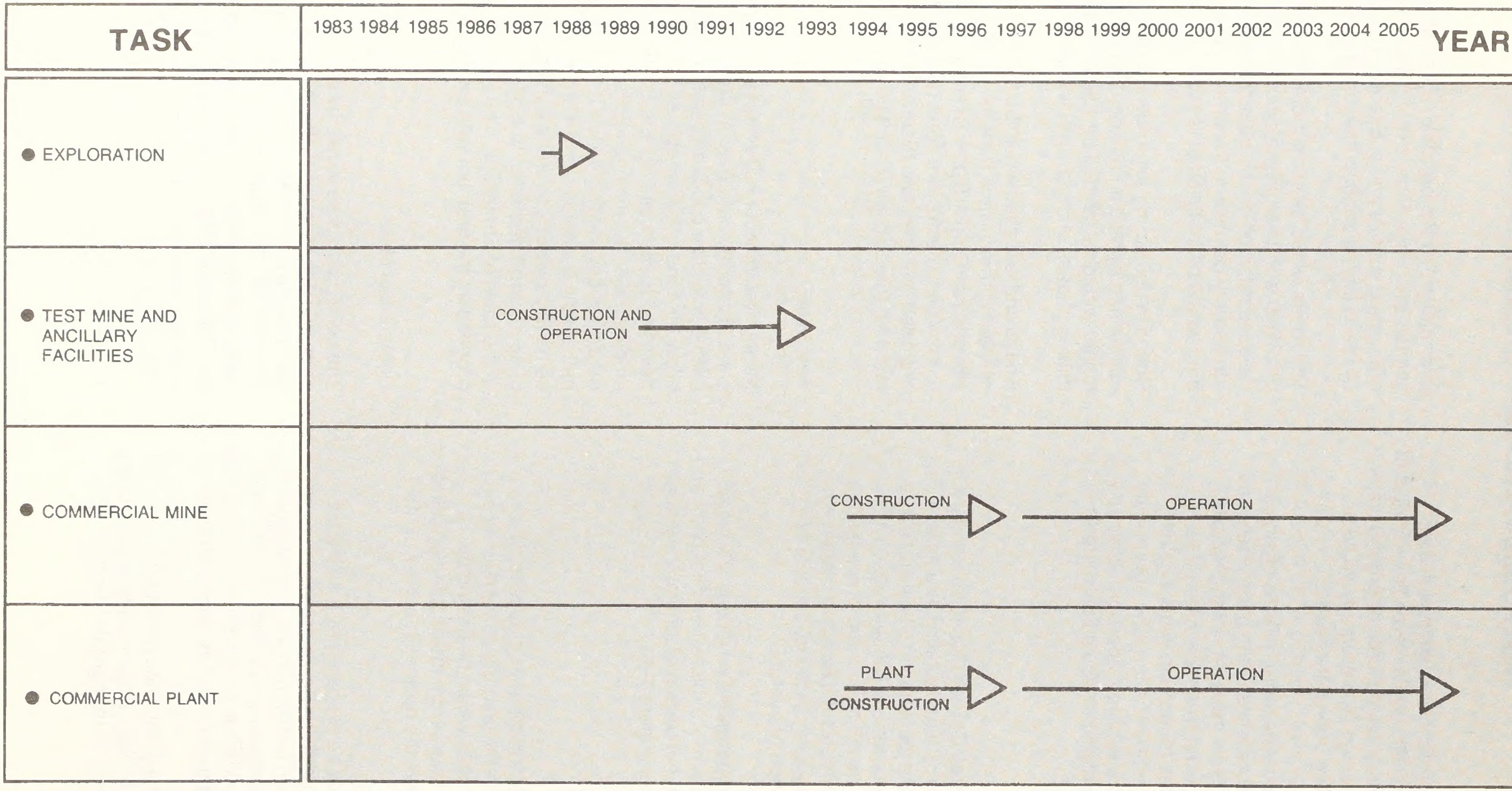


FIGURE 1-11 CHEVRON-GNC PLAN OF OPERATIONS SCHEDULE

An estimated 210 million tons of waste rock would be removed from the conversion area to recover the estimated 200 million tons of ore. The waste rock is expected to be consolidated and would require blasting for removal. Large rotary blast hole drills would be used to opén 12-inch diameter blast holes along 50-foot high mining faces. Blasting would be done with a mixture of ammonium nitrate and fuel oil (ANFO).

Ore and waste rock would be loaded and hauled with 12-cubic-yard shovels and 85-ton haul trucks. Initially, 65 million tons of waste rock would be placed in a canyon below the elevations of the tar sand horizons. This canyon is southwest of the mine area, on areas controlled by Chevron, but not on the area to be converted. After mining year 7, waste rock would be backfilled into mined-out areas as the face is advanced.

With the open pit mining plan, a number of benches or levels would be active at any given time. The simultaneous mining of ore from several faces would aid in maintaining an average feed rate and grade for processing. The number of faces mined within the conversion area would be determined at a later date.

The ore would be drilled, blasted, and loaded at the mine site then moved to a primary crusher on the edge of the mine property and crushed. Next, it would be fed into a grinding mill and slurry preparation plant located in Whitmore Canyon and transported as a slurry to the processing plant in a pipeline.

Following the cessation of mining, Chevron proposes to reclaim the flat, upper waste dump surfaces and the haul roads. The only areas suitable for topsoil salvage are on the upper portion of Patmos Ridge. Topsoil from these areas would be removed, stored, and ultimately used for waste dump and haul road reclamation.

Only small quantities of ground water seepage into the mine area is anticipated. Spring runoff and precipitation runoff would be directed to sedimentation ponds. These ponds would be periodically cleaned. Sedimentation ponds would be constructed below the dump toes in each of the canyons draining the mine area.

Pollutants expected to enter the downstream water may include total suspended solids and nitrates (from blasting agent). Other pollutant increases are not known at this time. Prior to undertaking mining, additional water quality information would be collected. This information would serve as a background against which water quality monitoring data collected during mining could be compared.

Access to the mining area would be controlled by eliminating public access roads and trails other than those roads used by operating personnel. Roads used by the operation would be secured by locked gates or guarded gates at all times.

Reclamation of abandoned haul roads and completed waste dumps would be initiated during mining. It is estimated that 50 acres of reclamation activity could be accomplished yearly. After the utilization of whatever topsoil has been salvaged from the mining operation for top dressing, the areas would be fertilized and seeded with an appropriate seed mixture. During the life of the mining operation, a reclamation research program would be developed to investigate effective reclamation vegetation species, fertilization needs, and planting techniques. Proposed reclamation procedures are identified in Appendix A-7, Reclamation and Erosion Control Programs.

Additional Environmental Protection Measures

In addition to the construction and operation procedures identified in previous sections, Chevron-GNC has identified the following environmental protection measures to which the company is committed.

- No water used in processing tar sand or tar sand oil would be discharged to surface waters.
- Mill tailing disposal areas would be designed to minimize influence on ground water.
- Spill prevention and control plans would be developed to prevent loss of oil and fuels to surface waters.
- Water withdrawals would be adjusted and timed to avoid damage to fish.

- Surveys of wildlife in the area would be conducted in cooperation with the Utah Division of Wildlife Resources and Fish and Wildlife Service to identify sensitive wildlife populations.

- Archaeological, soil, and vegetation surveys and paleontological and mineable resource reviews would be conducted in order to develop plans for any necessary mitigation.

Enercor

Enercor plans to convert 3 leases totaling 1,962.67 acres. Their locations are shown on Map 1-2 (map pocket).

The Enercor leases are discontinuous and scattered among the properties of other companies such that any major combined hydrocarbon lease holder would have difficulty operating a major commercial mining project without cooperation from neighbors. Enercor has participated in discussions concerning joint and cooperative resource development. However, since no definite plans for cooperative effort have been finalized, Enercor is prepared to carry out project development work on an individual company basis and has structured its proposed plan of operations accordingly.

As outlined in the proposed plan of operations (Enercor 1982), Enercor proposes to carry out a program for the commercial production of bitumen and associated hydrocarbon products from tar sand in 5 phases:

- Evaluation of the tar sand resource and associated mining and milling potential

- Permitting and initial project engineering

- Detail design and construction of the project

- Commercial production of bitumen from the leased resource in an initial production mode, and then at full production

- Decommission (abandonment) and restoration

At the present time, Enercor has determined the specific details for the Phase I program. Because Phases II, III, IV, and V are dependent on the results of Phase I, Enercor only has outlined these phases conceptually. As information is made available from Phase I evaluation work, Phases II, II, IV, and V would be updated and the proposed plan of operations would be amended as appropriate.

Figure 1-12 illustrates an anticipated time schedule for the plan of operations.

Exploration

The exploration program would be carried out in 5 parts. Initial reconnaisance would consist of gathering available information and conducting a literature search. Field mapping of the tar sand outcrops which are visible in the canyons would follow. The next step would be systematic drilling and development. It is estimated that about 12 drill holes would be needed. Some temporary site preparation and road work would be required. Core samples would be taken and analyzed for bitumen, viscosity, sand properties, and trace elements. Next, a site would be determined for the mining of a bulk sample of tar sand ore (some 2,000 to 3,000 tons) for pilot plant testing and preliminary mining analysis. A site would be chosen where a minimum of overburden and disturbance to the terrain would occur.

Test Mine and Pilot Plant

It is anticipated that an area of 1 to 2 acres would be disturbed in the process of mining the needed 2,000 to 3,000 tons of tar sand ore. Dozers and front-end loaders would be required to move overburden and to load 30-ton highway trucks with tar sand ore. The ore and/or overburden could require drilling and blasting prior to removal or loading. Some road work, stream crossing improvement, and other temporary measures could be necessary, in order to facilitate the movement of ore trucks to and from the deposit.

The mining work would be performed during the summer in dry weather. The mining would be accomplished in the least amount of time feasible (approximately 2 to 4 weeks).

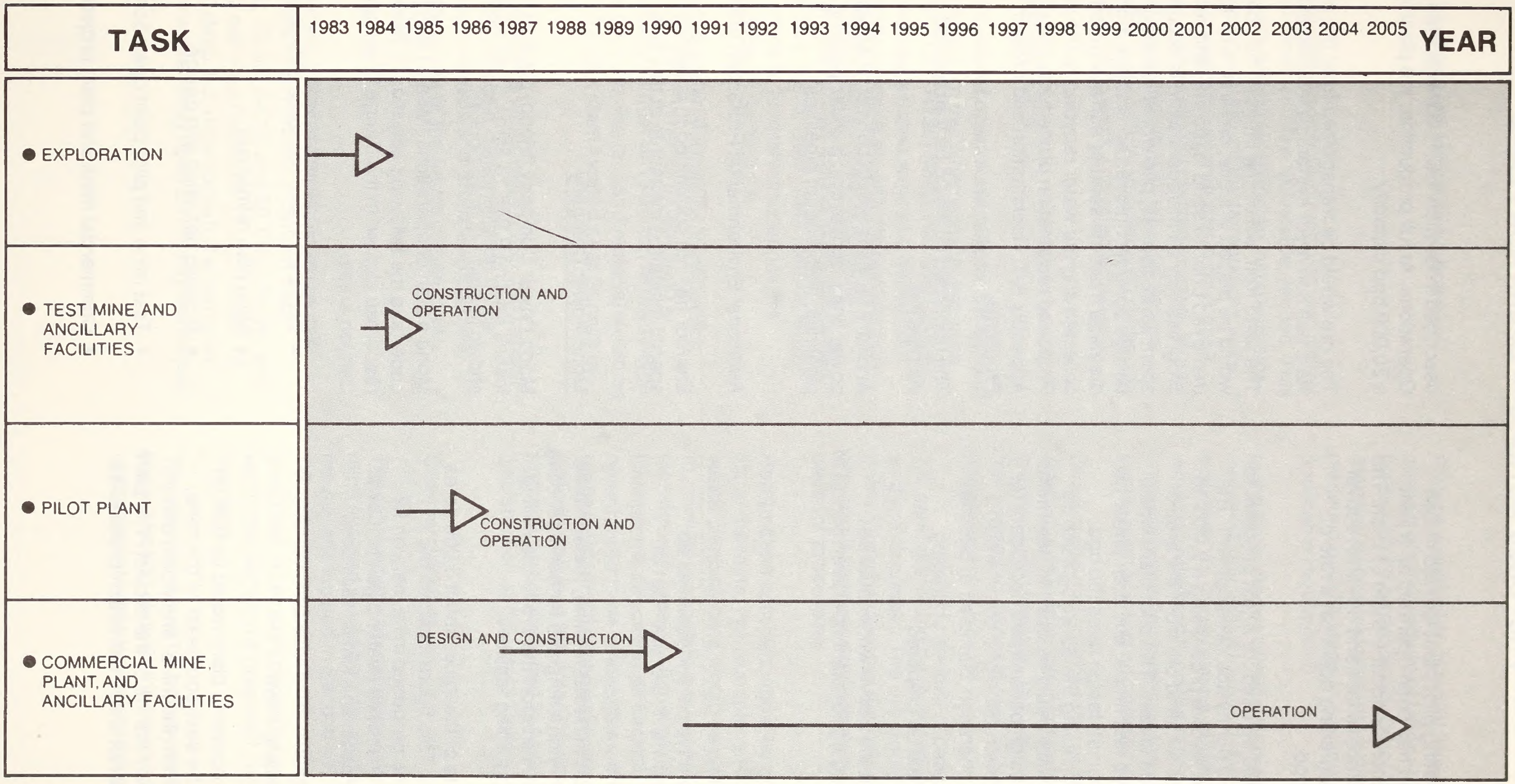


FIGURE 1-12 ENERCOR PLAN OF OPERATIONS SCHEDULE

Enercor has an existing pilot plant located in Salt Lake City. The plant has been operated as a joint venture between Enercor and the State of Utah. The plant was built to process tar sand ore and recover clean bitumen of upgrading quality at a rate of approximately 50 bpd.

This pilot plant would be used for a test program for Enercor's proposed Sunnyside development. The test program would involve processing a 2,000- to 3,000-ton sample of tar sand ore from the area of Enercor's Sunnyside leases. The pilot plant would be operated first in a test mode, and then under full continuous operation at design rates (50 bpd bitumen production), using the Sunnyside ore as feedstock. Test results would be used to determine the scale-up and design parameters necessary for engineering and construction of a commercial mining and milling operation. Samples of bitumen that could be evaluated in various upgrading processes also would be prepared.

It is anticipated that the above work could be accomplished during a pilot plant operation period of 3 to 6 months.

Commercial Mine

The mine would be a typical surface mine as described in Section 1.C.1, General Plan of Operations.

The mine area would include the mine, mine-related facilities, and primary crushing and tar sand handling systems that would transport the ore to the milling, processing, and upgrading facilities.

Over the 20-year life of the mine, about 3,000 acres would be disturbed. This figure includes the disturbance from the proposed mine, canyon fill areas, and ancillary facilities (water pipeline, power transmission line, roads, and similar facilities).

Commercial Processing Plant

The commercial processing plant would be built on the valley floor to the east-southeast of the mine, some 3 to 4 miles from the mine, and would disturb about 100 acres over the life of the project. The plant would use a typical hot water extraction process as described in Section 1.C.1, General Plan of Operations. At full production, the plant would have a 20,000 bpd capacity.

The ore would be transported from the mine to mill via a belt conveyor system paralleling existing roads.

The sand from which the bitumen has been removed would be placed in a pile, covered with topsoil (removed prior to sand laydown), and revegetated progressively as the spent sand is accumulated. The spent sand disposal pile would be designed using tailings pond techniques so that any moisture drainage from the sand or surface runoff would be collected and the water recycled to the plant. Proposed reclamation procedures are identified in Appendix A-7, Reclamation and Erosion Control Programs.

The upgraded oil would be transported to a market via pipeline.

Ancillary facilities would consist of access roads, power lines, conveyors, a water pipeline, bitumen pipelines, and product pipelines.

Additional Environmental Protection Measures

Enercor has not committed to implementing any special mitigation measures at this time.

Mono Power Company

Mono Power Company (Mono) plans to convert 7 leases totaling 9,836.13 acres. Their locations are shown in Map 1-2 (map pocket).

Mono's plan of operations (Mono 1982) proposes to undertake the following activities to develop tar sand resources located in the Range Creek and Whitmore Canyon areas:

- Exploration and resource definitions
- Mine plan refinement
- Process definition and design
- Test mine and pilot plant operations
- Commercial mine and plant project

The project development schedule is shown in Figure 1-13.

Exploration

Mono has completed some field mapping and drilled 31 exploration wells on their Sunnyside deposit. This exploration work has given Mono an initial estimate of the quantity and quality of the tar sand resource, but does not present a comprehensive data base upon which a definite project could be based. Mono has prepared the preliminary mining and project plans, but these plans will be updated and refined as additional exploration work and other activities continue.

Test Mine and Pilot Plant

The proposed plan of operations calls for tar sand to be mined initially from the Whitmore Canyon area (Section 24 of T13S, R13E) (Map 1-2, map pocket). (Additional pilot plant mines would be developed within the Range Creek area with their production rates being determined by Mono's ongoing exploration program.) The mining would be carried out on some 30 acres of Utah State mineral lease land and 80 acres of federal lease land in the southwest quarter of Section 24.

Once mined, the material would be transported down the Left Fork of Whitmore Canyon to a crushing station by a fleet of 13 20-ton highway-type trucks. Once crushed, the tar sand material would be transported to a pilot plant located near Sunnyside, Utah.

The pilot plant facility would have a 250 bpd capacity to allow for the full-scale demonstration of the various process vessels and process ancillaries. This would allow test of the future commercial operational viability.

Commercial Mine

Commercial mining operations would occur in 2 separate mines—the Whitmore Canyon tract (Sections 12, 13, 23, 24, 25 and 26 T13S, R15E) and the Range Creek tract (Sections 11, 12, 15 and 16, T14S, R14E) (Map 1-2, map pocket). Tar sand ore would be extracted using open pit mining techniques at both tracts.

Prior to overburden removal, the area would be cleared of all woody vegetation. Merchantable timber would be salvaged. Other large trees in the area would be bulldozed into a pile and burned or placed in backfill areas in a manner consistent with applicable regulations.

In the early stages of mine pit development, topsoil would be stockpiled for use in future reclamation activities. As the sequence progresses, topsoil would be removed from the stripped area and immediately redistributed on the replaced overburden burning pit backfilling.

Overburden and interbedded waste would be drilled, blasted, and loaded into haul trucks using shovels and front-end loaders. The waste would be transported to disposal piles or backfill areas of the active pit.

Tar sand ore would be removed in the same manner as the overburden. The ore would be hauled to a primary crusher located near the active pit. Crushed ore would be moved by conveyor to the extraction plant for processing.

Reclamation activities would be ongoing during the life of the mine. For example, all inactive topsoil and waste disposal piles would be seeded and mulched to promote a vegetative cover and reduce material loss through erosion. Additionally, overburden transported directly to pit backfill areas would be recontoured to be compatible with surrounding topography and drainage systems, and seeded with species native to the area. Proposed reclamation procedures are identified in Appendix A-7, Reclamation and Erosion Control Programs.

Commercial Plant

The tar sand would undergo primary crushing at the mine site and would be transported via conveyor to the mill site located in Section 17, T15S, R15E (Map 1-2, map pocket) where the bitumen would be extracted. After extraction, the processed sand would be placed in a prepared disposal area west of the plant.

The bitumen would be transported via pipeline from the extraction plant to the upgrading plant. The upgrading process would produce a synthetic crude

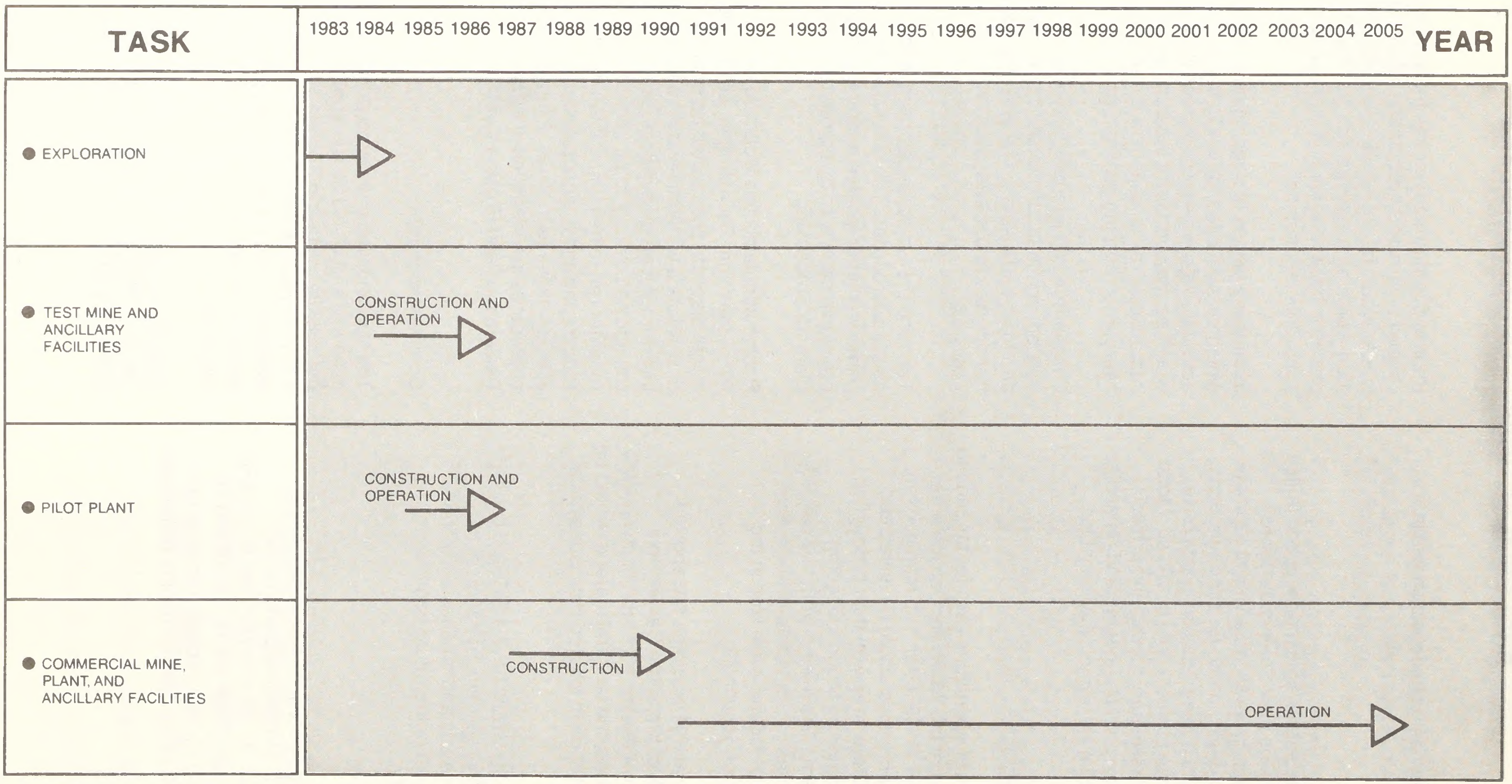


FIGURE 1-13 MONO PLAN OF OPERATIONS SCHEDULE

which would be transported from the upgrading plant via pipeline.

Ancillary facilities would consist of access roads, power lines, a water pipeline, conveyors, bitumen pipelines, and product pipelines.

Additional Environmental Protection Measures

1. As monitoring and ongoing studies identify impacts or a potential for impact, Mono has committed to using reasonable measures to mitigate impacts to the extent possible.

2. The following studies to identify existing ground water and surface water characteristics will be undertaken or are already under way:

   - Inventory of water rights and users that may be affected

   - Inventory to identify springs in the areas to be affected by mining

   - An assessment of the quantity of ground water exchange or reduction by surface stream segments

   - Installation of ground water monitoring wells to determine aquifer characteristics and to define problems of ground water movement

   - Column leach studies on proposed sand and overburden waste materials will be conducted to estimate potential chemical constituents of ground water percolating through reclaimed areas

3. The following alternatives are under investigation to address the mitigation of potential project-related impacts to the Sunnyside water resources.

   - Development of alternate water sources by providing increased capacity in supply lines to the mine facility from the proposed water supply for the tar sand development

   - Cooperative agreements with the communities pertaining to enhancement of existing systems by developing available poorer quality sources near the communities of Sunnyside and East Carbon for irrigation purposes within the towns, thereby reducing the demands on current better quality water supplies and on water treatment facilities

   - Cooperative agreements for the enhancement of water treatment and wastewater disposal facilities

Sabine Production Company

Sabine Production Company (Sabine 1982) proposes to convert 5 leases totaling 7,240.04 acres. Their locations are shown on Map 1-2 (map pocket).

Sabine's proposed plan of operations (Sabine 1982) consists of 4 phases—exploration, development, production, and reclamation. A general schedule is shown in Figure 1-14.

Exploration

The exploration phase would consist of 2 stages—definition and delineation. During the definition stage, about 22 core holes would be drilled; during the delineation stage, about 20 wells would be drilled. The areas of promise would be shown in the submission with a preliminary conclusion as to how the tar sand in each such area would be produced. Approval would be requested for any location changes or additional core holes required to delineate properly the tar sand areas to be produced.

Development

The development phase would consist of planning and securing approval for the production method, upgrading process, environmental protection, and the water supply and access, followed by constructing the bitumen processing facilities, drilling injection and producing wells, and installing surface facilities. It is estimated that this stage would require 3 years.

Although the plan of operations addresses only an in-situ cooperation for the conversion area, the type of in-situ process selected would depend upon the results obtained during the exploration phase. Both

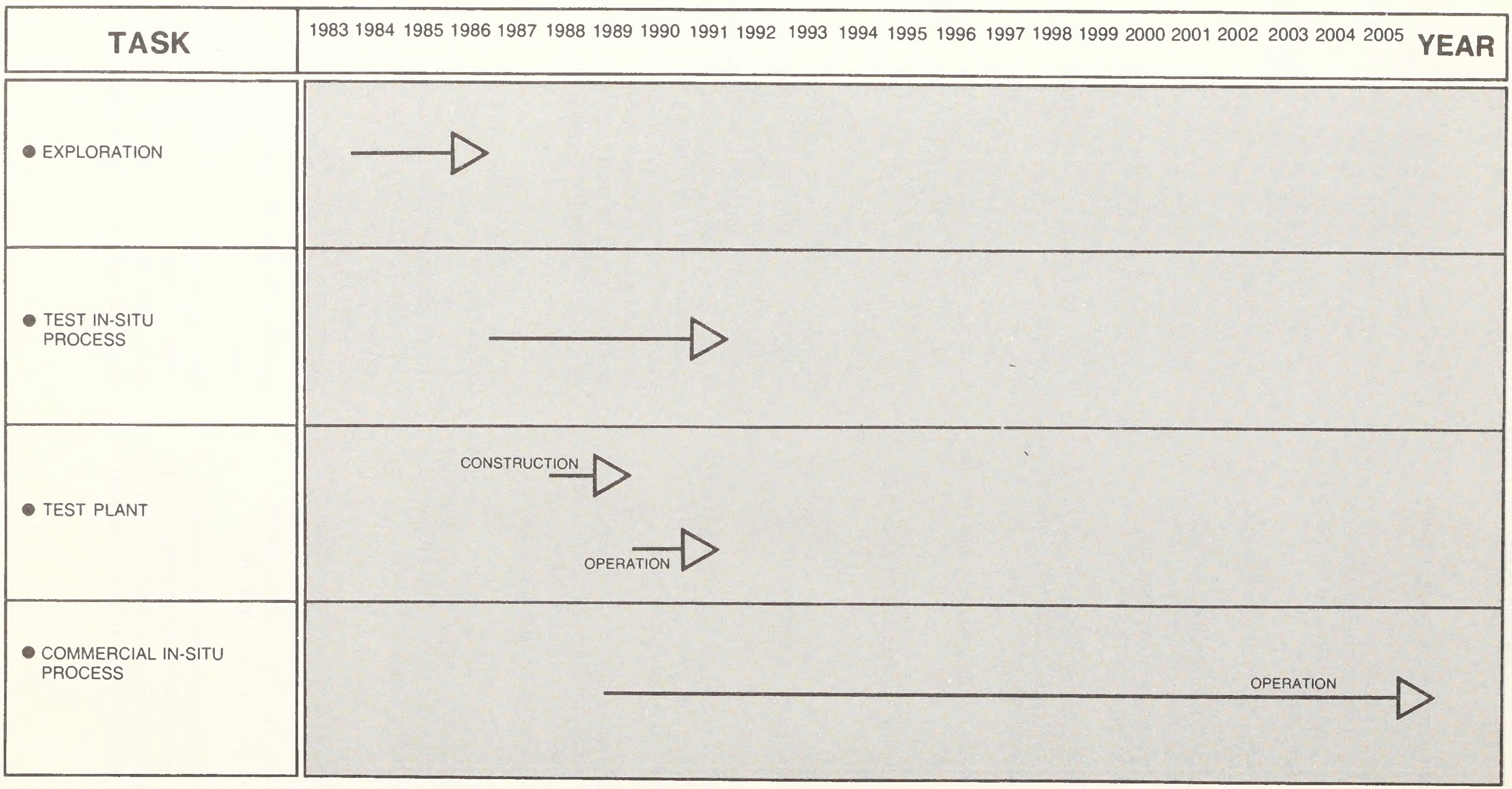


FIGURE 1-14 SABINE PLAN OF OPERATIONS SCHEDULE

thermal and solvent processes would be investigated. However, based on present knowledge, it appears a steam injection method would be most likely.

The development phase would overlap the production phase, as some bitumen would be extracted prior to completion of facility construction. In the interim, bitumen would be stored in tanks.

Production

During the production phase, crude bitumen could be extracted by injection of steam through injection wells into the tar sand, extraction of the heated (approximately 150°F) tar-water mixture through producing wells, and separation of the bitumen and recovered water. The bitumen then could be transported via pipeline to an off-site upgrading facility.

The wells would be drilled at a rate of 150 wells per year. Vertical drilling is anticipated for most areas, although there is a possibility that horizontal drilling into the tar sand face exposed along the canyon walls would prove commercial in certain areas. Few, if any, of the wells planned for the production phase would be drilled below 1,000 feet, and all would be drilled in sequential order in an essentially continuous drilling program. Flowline and injection lines would be placed in corridors along the roads to the various well patterns and would require no appreciable surface work for their installation.

Based on known data, it is likely that a steam injection process would be employed using standard spacing patterns and that these patterns would be drilled outward onto the several plateaus from a central plant site which would contain the heat source and bitumen treating unit. The patterns would be drilled to the economic limit of the tar sand accumulation, as determined by the data obtained from the exploration phase. At present, it would appear that commercial production could not be anticipated from tar sand having less than 36,000 barrels per acre in place. This would require a minimum of 30 feet net thickness for tar sand with 60 percent saturation and 25 percent porosity, or 100 feet for 30 percent saturation and 16.7 percent porosity. It is believed that these saturation-porosity ranges cover the averages likely to be encountered in the proposed conversion area. As an extraction area is depleted (about 5 to 10 years) new wells would be drilled in nondepleted areas.

Sabine does not propose to exclude from development all acreage having less than 36,000 barrels per acre. Acreage containing 12,000 barrels per acre would be retained in the unit if, as anticipated, such acreage is contiguous with high in-place resource values.

Individual extraction wells would have a smaller product pipeline feeding into the main line and would be equipped with a conventional pumping-jack type unit and a power supply line paralleling the pipelines.

The steam required for injection could be produced by burning coal. The main steam line leading to the extraction well area typically could be in the 12- to 18-inch diameter range with smaller (2-inch diameter) branch lines leading to individual steam injection wells. Since some of the condensed injection steam is recovered with the extracted tar-oil mixture and reused, about 5,000 acre-feet per year of make-up water would be required for a 5,000 bpd operation.

For analysis purposes, it was assumed that 100 percent of the area proposed for in-situ development would be disturbed. The disturbance would be confined to the surface and near-surface (i.e., no removal of soil or overburden). Of the 100 percent disturbance, the assumption was that 40 percent would be directly disturbed (graded) by construction of the actual recovery well facilities, including access roads and streams and product pipeline systems. The remaining 60 percent would be indirectly disturbed through worker and off-road vehicle travel.

As recovery of the bitumen is completed in each pattern, wells within the pattern would be abandoned with no equipment left above ground. Those pipelines no longer needed for that pattern would be taken up and any surface disturbance reclaimed. Upon completion of the last pattern, all pipelines would be removed and the heat-source and bitumen treating plants dismantled. The surface would be returned to as useable and as aesthetic condition as possible. Proposed reclamation procedures are identified in Appendix A-7, Reclamation and Erosion Control Programs.

Ancillary facilities would consist of access roads, water pipelines, and a product pipeline.

Additional Environmental Protection Measures

Sabine has not committed to implementing any special mitigation measures at this time.

1.C.3 ENERGY EFFICIENCY

Overall energy efficiency is defined as the net energy output divided by the net energy input times 100. Net energy outputs are basically the British thermal units (Btu's) contained in the products and by-products. Net energy inputs are more complex, but they can be broken down into sections, each of which can be dealt with separately and combined in various ways as needed. The major sections are:

- Mining the tar sand
- Transporting the ore and other needed material, such as water, to the processing plant
- Processing the raw material, extracting, and upgrading
- Transporting the products, by-products, and waste products
- Indirect energy, which includes energy needed to produce the final products and equipment to do the job
- Infrastructure energy, which includes energy used by the employees of the project, their families, and secondary industries (including social services)

Data on net energy requirements for tar sand projects are not specifically available in the literature. Consequently, the net energy analyses summarized here are only approximations of the efficiency that could be expected from the applicants' projects. Depending on the length of the ancillary facilities (roads and water and product pipelines), the efficiency of a particular project could vary by approximately 4 percent.

The following calculation is for a tar sand project that includes a typical surface mine with average ancillary facilities and a typical 20,000 bpd processing plant. The energy content shown for energy inputs and output represents equivalent barrels of oil per day.

Net Useable Output	20,000 bpd
Input	
Energy in Tar Sand Resource	26,000 bpd
Other Fuels Used	2,000 bpd
Indirect Energy	5,000 bpd
Infrastructure	3,000 bpd
Total Input	36,000 bpd

Percent Efficiency (including the energy in the tar sand) $= \frac{20,000}{36,000} \times 100 = 55.6\%$

Another way to view energy output is to disregard the energy in the tar sand. In which case, for an investment of 10,000 bpd the projects would yield 20,000 bpd, thereby making available 10,000 bpd of new or additional energy.

In-situ process efficiencies are not available; however, it can be assumed that the percent recovery of the oil in place would be fair to good (approximately 40 to 50 percent) and that the above ground processing efficiencies would be about the same as for the other processes. With this in mind, the overall in-situ energy efficiency would be an estimated 20 to 30 percent.

The following is a comparison of energy production from tar sand and other energy sources:

Type	Percent Efficiency
Oil From Tar Sand In-Situ	20 to 30
Shale Oil from an Underground Mine	30 to 40
Crude Oil to Petroleum Products	30 to 40
Electrical Power from Coal	
Strip Mines	33 to 43
Underground Mines	31 to 41
Uranium to Electricity	17 to 27
Electrical Power from Natural Gas	35 to 45
Oil from Tar Sand Strip Mines	45 to 55

Source: *Energy analysis handbook for preparation of oil shale development environmental impact statements*. Prepared by Bureau of Land Management, Colorado State Office. March 1982.

1.D PARTIAL CONVERSION ALTERNATIVE AND/OR SPECIAL MITIGATION

For ease of reference in this EIS, the title of this alternative is hereafter shortened in text, tables, and maps to read only as the "partial conversion alternative." However, the reader should be aware that it also describes conversion with special stipulations to attain essentially the same environmental protection.

This alternative would incorporate constraints to permit or reduce environmental land-oriented impacts. Such constraints could be achieved by partial conversion of leases (modified lease boundaries) or by special stipulations specifically tailored to minimize surface disturbance (limited or no surface occupancy).

This alternative is based on assumptions (including production level, project components, and operation parameters). These were developed by BLM for the purpose of assessing potential impacts. This alternative is not proposed by any applicant.

The purpose of this alternative is to provide an assessment of the impacts of providing substantial protection to various resource values. The alternative, therefore, should not be viewed in an all or nothing situation, rather as a list of potential constraints from which a decision maker can choose as a final decision is developed. The production level was developed without reference to any production plans by the applicants nor the inground resource. Its sole purpose is in providing a midpoint for air quality and socioeconomic impacts and should not be used for assessing the benefits in terms of barrels per day of production from this alternative.

The areas assumed to be in this partial conversion alternative are shown on Map 1-5 (map pocket). The number of acres proposed for conversion by individual applicants that occur within the area assumed in this alternative are identified on Table 1-5.

TABLE 1-5
ACRES OF APPLICANT-PROPOSED CONVERSION AREA INCLUDED IN PARTIAL CONVERSION ALTERNATIVE

Applicant	Area Included (acres)	Area Constrained or Excluded (acres)
Amoco	6,402	3,200
Chevron-GNC	0	160
Enercor	120	1,843
Mono	2,914	6,922
Sabine	5,410	1,830
Total	14,846	13,955

Note: See Map 1-5 (map pocket) for location of included areas.

The land area included in the partial conversion alternative was determined based on criteria designed to protect critical areas that would undergo adverse impacts. The criteria used are listed as follows. It should be noted that while adverse impacts could occur to several resources not mentioned in the criteria listed (for example, socioeconomics, air quality, and transportation networks), it is not possible to reduce or eliminate these impacts by constraining specific areas from development based on the resource data presently available.

Constraining Criteria

Any area that met one or more of the following criteria was determined to be a "critical area" and was excluded in the partial conversion alternative. Where applicable, the regulatory authority for a criterion is identified in parentheses.

- Areas where the proposed land disturbing activities could result in violation of Utah Department of Health standards for domestic uses of domestic water sources currently used or having the potential to be used within the Sunnyside STSA (Grassy Trail Reservoir and Range Creek) (Public Law 294 and various orders of withdrawal). Areas meeting this criterion are labeled as critical areas on Map 3-1 (map pocket) and shown as eliminated areas on Map 1-5 (map pocket).

- Areas of federal land that include federally designated critical habitat for threatened or endangered plant or animal species that have been determined to be of essential value to the species by the Fish and Wildlife Service or the surface management agency and where the presence of the species in question has been scientifically documented (Endangered Species Act of 1973, as amended). No areas that met this criterion were identified within the main block of the Sunnyside STSA. However, no surveys for threatened or endangered species have been completed to date (July 1983).

- Areas of federal land that include an active bald or golden eagle nest plus an appropriate buffer zone of land around the nest site (Bald Eagle Protection Act of 1940 and Endangered Species Act of 1973, as amended). No areas that met this criterion were identified within the main block of the Sunnyside STSA. However, no surveys for threatened or endangered species have been completed to date (July 1983).

- Areas of federal land which the State of Utah and the surface management agency jointly agree are fish or wildlife habitat for resident species of high interest to the state and essential for maintaining these priority wildlife species. Examples of areas that serve a

critical function for the species involved include active dancing or strutting grounds for grouse species, critical seasonal ranges for deer and elk, and migratory corridors for elk. This criterion is based upon Coal Unsuitability Criteria as published in the **Federal Register** under regulations pertaining to Coal Management of Federally Owned Coal (43 CFR 3461-1). Areas meeting this criterion are labeled as critical areas on Map 3-4 (map pocket) and are shown as eliminated areas on Map 1-5 (map pocket).

- Areas where proposed activities would cause permanent disruption of livestock trailing routes, grazing patterns (to the extent that an important area would be isolated), or important livestock watering sources. Areas meeting this criterion are labeled as critical areas on Map 3-2 (map pocket) and are shown as eliminated areas on Map 1-5 (map pocket).

- Areas viewed from the valley areas west and south of the STSA where proposed activities would cause visual contrasts that would not meet the objectives of the Visual Resource Management Class in which the area is located. Areas meeting this criterion are labeled as critical areas on Map 3-5 (map pocket) and are shown as eliminated areas on Map 1-5 (map pocket).

- Areas where project activities would eliminate an essential public access route. No such areas were identified within the main block of the STSA.

- Areas that contain cultural resources that cannot be mitigated easily by recording and/or excavation (for example, trail rut, pictograph, petroglyph, or large site that would require a long time period for excavation and artifact and data analysis) or areas that contain cultural resources eligible for inclusion on the National Register of Historic Places. No such areas were identified prior to publication of this EIS; however, when 1983 field season surveys are completed, areas meeting these criterion may be identified. If so, the Final EIS will be modified accordingly. (National Historic Preservation Act of 1966 (No. USC 470) and Executive Order 11593 (36 FR 8921, May 1971).)

Analysis Assumptions

The production-related assumptions for this alternative were based on the total acreage to be mined (as determined by the constraining criteria identified in the previous section) and a determination to include an oil production level intermediate to the production levels proposed by the applicants in their plans of operations and the production level assumed for the unitized development alternative. The assumptions made were not based on any plans proposed by the applicants.

Under this alternative, the bitumen associated with the tar sand resource underlying 14,846 acres would be recovered. It is assumed that for a given area, the same method of tar sand recovery as proposed in the applicants' plans of operations would be used; however, recovery would occur at a reduced rate. It is assumed that the tar sand ore recovered by surface mining techniques would be processed at one 75,000 bpd plant (with milling and upgrading facilities) to be centrally located near Sunnyside, Utah. Spent sand would be disposed of adjacent to the plant. Bitumen extracted through in-situ recovery techniques would be processed in a 5,000 bpd plant (with steam generation facilities) to be located within the conversion area.

Based on the 80,000 bpd rate of processing and the area of land to be mined, a project life under this alternative was assumed to be 49 years. Based on the reclamation sequence assumptions outlined for the proposed actions in Section 1.C.2, Applicants' Plans of Operations, it was assumed that during steady- state, commercial-level operation, about 5,000 acres of land would be out of productive use over a 25-year period.

Peak construction work force requirements were assumed to be approximately 1,880 workers; peak operation requirements were assumed to be approximately 3,700 workers (Table 1-12, Section 1.H.1).

1.E UNITIZED DEVELOPMENT ALTERNATIVE

The unitized development alternative assumes that all the lease tracts proposed for conversion by the applicants would be approved. However, it assumes that they would be developed cooperatively rather than as separate operations as proposed in the applicants' plans of operations. Under this alternative, a logical mining sequence that ignores ownership boundaries would be used to maximize resource recovery. The mining sequence could be based on one or more unitized plans. It is assumed that the mining unit(s) would include all the applicants' proposed conversion areas plus the private land within the STSA that Chevron intends to mine. (Note that this mine is considered as an interrelated project for the proposed actions, partial conversion alternative, and no action alternative; thus, the unitized development alternative is not directly comparable to any of these.)

Although all of the applicants have expressed interest in unitized development of the STSA, at this time, no agreements to this effect have been finalized between any of the 5 applicants. Thus, the parameters assumed for this alternative have been determined by BLM and are not based on a specific plan proposed by the applicants or being considered by the proponents of Chevron's interrelated project.

Under this alternative, it is assumed that for a given area, the same methods of tar sand recovery as proposed in an applicant's plan of operations would be used; however, recovery would occur at a reduced rate. It is assumed that all tar sand ore mined within the STSA (both that recovered from the conversion areas and that recovered from Chevron's interrelated mine) would be processed at one plant (wlth milling and upgrading facilities) to be centrally located near Sunnyside, Utah. Bitumen extracted through in-situ recovery techniques would be processed at this plant. Based on discussions with industry personnel as to what might be a likely scenario for unitized development, the production level for the processing plant was assumed to be 50,000 bpd.

An operation of this size would require approximately 7,140 acres for spent sand disposal. It was assumed that approximately 3,500 acres of land adjacent to the processing plant would be used for spent sand disposal. The remaining 3,640 acres of land that would be required for spent sand disposal would be at some other undetermined location(s) in the Sunnyside area.

Based on the 50,000 bpd rate of processing and the area of land to be mined, project life under this alternative was assumed to be 94 years. Based on the reclamation sequence assumptions outlined for the proposed actions in Section 1.C.2, Applicants' Plans of Operations, it was assumed that land disturbance would gradually increase to a steady-state, commercial-level operation, of about 3,500 acres of land out of productive use at one time, and continue for about 60 years and then gradually decrease to the end of the project life.

Peak construction work force requirements were assumed to be approximately 475 workers; peak operation requirements were assumed to be approximately 2,465 workers (Table 1-12, Section 1.H.1).

1.F NO ACTION ALTERNATIVE

The no action alternative would involve denial of all the requested lease conversions. Since the time when the conversion applications were filed, the primary termination dates of 18 of the oil and gas leases in question have been suspended until decisions on the reqested conversions have been made; the 5 other leases in question are still within the original lease period (in other words, have not reached the expiration date).

A decision not to convert would result in the termination of the 18 leases (containing 25,462 acres) whose terms have been suspended. However, the other 5 leases (containing 3,339 acres) would remain in effect and could be extended beyond the normal termination date by timely drilling under the oil and gas regulations.

It is assumed that under this alternative no tar sand development would occur on federal land within the Sunnyside STSA. If the environmental impacts of tar sand development were considered too great to permit conversion of the applicants' leases, it is likely that potential impacts would be considered too great to offer new federal combined hydrocarbon leases in the area. However, it is assumed that the

interrelated projects would be developed as currently envisioned (Section 1.A.5, Interrelationships). Based on these assumptions, Chevron's interrelated mine on private land and the associated processing plant would be the only tar sand operation within the STSA.

1.G ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

No site-specific alternatives that have been proposed were eliminated from detailed analysis. As long as a lease conversion applicant provides the data required by the Combined Hydrocarbon Leasing Act and BLM lease conversion regulations, BLM is not in a position to discount how valid an application is. These applications must be treated at face value and the NEPA process followed. The contents of each application represents that applicant's intention to carry out diligent development. Alternatives to tar sand development in general, such as conservation or solar energy development, are not considered in this EIS, but are addresed in the **Utah Combined Hydrocarbon Regional EIS** (BLM 1983a), which discusses the entire federal tar sand program.

1.H DATA SUMMARY

Tables 1-6 through 1-12 provide a data summary of the proposed actions and alternatives. Information provided in this summary is based on the applicants' proposed plans of operations and the analysis assumptions outlined in Sections 1.C through 1.F. Information provided in the data summary tables includes tar sand mined, water use (proposed actions and alternatives), total area disturbed, removed, and reclaimed (proposed actions), total area disturbed by project component (proposed actions and alternatives), and annual construction and operation work force requirements (proposed actions and alternatives). The no action alternative is considered in accordance with regulations of the Council on Environmental Quality and the National Environmental Policy Act. It is a valid alternative to be considered in the decision-making process.

The reader will note that there are differences among resource requirements for the five applicants. These differences do not represent discrepancies or inconsistencies among the applicants but rather reflect differences in available and estimated tar sand resource data, facility design, process technology, operating practices, and engineering philosophy among the companies.

TABLE 1-6
TAR SAND MINED[a]
(Proposed Actions)

	TEST MINE			COMMERCIAL MINE		
Applicant	Tons/ Year	Life (Years)	Tons Total	Tons/ Year (millions)	Life (Years)	Tons Total (millions)
Amoco	150,000	1	150,000	105	30	3,150
Chevron-GNC	132,500	1	132,500	7.4	30	222.0
Enercor	3,000	1	3,000	18	20	360
Mono	246,750	1	246,750	26.8	33	884.4
Sabine	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]	NA[b]
Collective Total	532,250	NA	532,250	157.2	NA	4,616.4
Interrelated Total	—	—	—	7.4	30	222.0
Cumulative Total	532,250	NA	532,250	164.6	NA	4,838.4

Note: NA = not applicable.
[a]Includes ore only, not tons of overburden.
[b]In-situ extraction proposed.

TABLE 1-7
WATER USE
(Proposed Actions)

Applicant	Exploration ac-ft/yr	Exploration Source	Test Mine and Pilot Plant ac-ft/yr	Test Mine and Pilot Plant Source	Commercial Operation ac-ft/yr	Commercial Operation Source
Amoco	1	South Spring/ Range Creek	46	Price River	12,000	Price River
Chevron-GNC	1	East Carbon City	46	Surface	4,500	Price River
Enercor	1	Range Creek	12	Town of Salt Lake	5,000	Range Creek
Mono	1	Surface	4	Town of Sunnyside	9,345	Green River
Sabine	1	Surface (Co. owned pond)	1,000	Green River	5,000	Green River
Collective Total	5	Surface	1,108	Various	35,845	Various
Interrelated Total	1	Surface	45	East Carbon City	4,500	Various
Cumulative Total	6	Surface	1,153	Various	40,345	Various

Note: ac-ft/yr = acre-feet per year.

TABLE 1-8
WATER USE (ac-ft/yr)
(Alternatives)

Alternative	Collective Use[a]	Cumulative Use[b]
Partial Conversion	20,738	25,238
Unitized Development	14,340	18,840
No Action	None	4,500

Note: ac-ft/yr = acre-feet per year.
[a]Conversion-related use.
[b]Conversion-related use plus interrelated project use.

TABLE 1-9
TOTAL AREA DISTURBED, REMOVED AND RECLAIMED (acres)
(Proposed Actions)

Applicant	EXPLORATION Disturbed	EXPLORATION Removed	EXPLORATION Reclaimed	OPERATION[a] Applicants' Plans of Operations Disturbed	Applicants' Plans of Operations Removed	Applicants' Plans of Operations Reclaimed	OPERATION[a] EIS Assumptions Disturbed	EIS Assumptions Removed	EIS Assumptions Reclaimed
Amoco	13	0	13	5,480	110	5,370	12,082	110	11,972
Chevron-GNC	4	0	4	325	170	155	325	170	155
Enercor	10	0	10	3,000	100	2,900	3,000	100	2,900
Mono	18	0	18	7,614	257	7,357	14,403	257	14,146
Sabine	21	0	21	6,135	45	6,090	6,135[b]	45	6,090
Collective Total	66	0	66	22,554	682	21,872	35,945	682	35,263
Interrelated Total	20	0	20	2,900	200	2,700	2,900	200	2,700
Cumulative Total	86	0	86	25,454	882	24,572	38,845	882	37,963

Note: Disturbed refers to total area that would be disturbed during construction and operation.

Reclaimed refers to total area that would be reclaimed during the life of the projects, including rights-of-way disturbance and spent sand disposal areas.

Removed refers to total area that would be occupied by surface facilities for the life of a project. Prior to project abandonment, the surface facilities would be removed and the disturbed acres reclaimed (with the possible exception of some roads that would be retained within the county network).

[a]The differences between the applicants' proposed plans of operations and EIS assumptions are explained in Section 1.C.2, Applicants' Plans of Operations.

[b]100 percent disturbance figure includes 40 percent primary disturbance plus 60 percent secondary disturbance. For more information regarding disturbance, refer to Section 1.C.2.

TABLE 1-10
TOTAL AREA DISTURBED BY PROJECT COMPONENT (acres)
(Proposed Actions)

Applicant	APPLICANTS' PLANS OF OPERATIONS[a] SURFACE MINE Mine	Plant	Spent Sand	Ancillary Facilities	IN-SITU Well Field/ Plant	Ancillary Faciltiies	TOTAL	EIS ASSUMPTIONS[a] SURFACE MINE Mine	Plant	Spent Sand	Ancillary Facilities	IN-SITU Well Field/ Plant	Ancillary Facilities	TOTAL
Amoco	3,000	110	1,500	870	—	—	5,480	9,602	110	1,500	870	—	—	12,082
Chevron-GNC	155	0	0	170	—	—	325	155	0	0	170	—	—	325
Enercor	1,500	100	1,000	400	—	—	3,000	1,500	100	1,000	400	—	—	3,000
Mono	4,510	57	2,177	870	—	—	7,614	9,836	57	3,640	870	—	—	14,403
Sabine	—	—	—	—	6,000	135	6,135	—	—	—	—	6,000	135	6,135
Collective Total	9,165	267	4,677	2,310	6,000	135	22,554	21,093	267	6,140	2,310	6,000	135	35,945
Interrelated Total	1,400	200	1,000	300	0	0	2,900	1,400	200	1,000	300	0	0	2,900
Cumulative Total	10,565	467	5,677	2,610	6,000	135	25,454	22,493	467	7,140	2,610	6,000	135	38,845

[a]The differences between the applicants' proposed plans of operations and EIS assumptions are explained in Section 1.D.2, Applicants' Plans of Operations.

TABLE 1-11
TOTAL AREA DISTURBED BY PROJECT COMPONENT (acres)
(Alternatives)

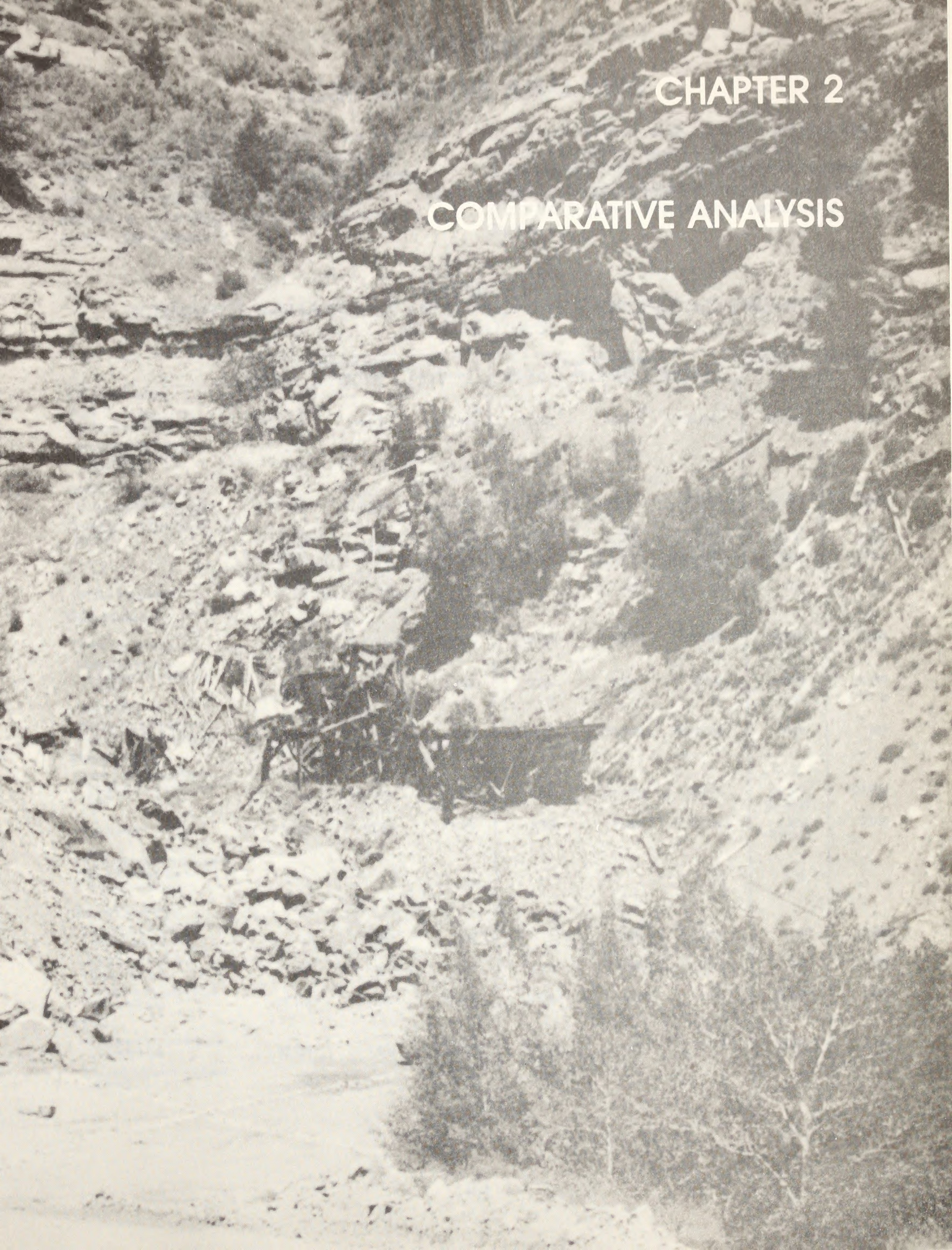
Alternative	SURFACE MINE Mine	Plant	Spent Sand	Ancillary Facilities	IN-SITU Well Fields/ Plant	Ancillary Facilities	Total
Partial Conversion							
Collective Total	9,436	262	4,355	1,720	5,410	135	21,318
Interrelated Total	1,400	200	1,000	300	0	0	2,900
Cumulative Total	10,836	462	5,355	2,020	5,410	135	24,218
Unitized Development	22,493	467	7,140	2,610	6,000	135	38,845
No Action							
Collective Total	0	0	0	0	0	0	0
Interrelated Total	1,400	200	1,000	300	0	0	2,900
Cumulative Total	1,400	200	1,000	300	0	0	2,900

TABLE 1-12
PEAK CONSTRUCTION AND OPERATION WORK FORCE REQUIREMENTS
(Proposed Actions and Alternatives)

	CONSTRUCTION Year	Personnel	OPERATION Year	Personnel
PROPOSED ACTIONS				
Amoco	1995	475	2003	2,465
Chevron-GNC	1994	2,000	1995	380
Enercor	1990	2,500	1991	800
Mono	1987	1,892	1989	1,230
Sabine	1988	60	1988	35
Peak Requirements	1989	3,810	2003	4,910
PARTIAL CONVERSION				
Surface Mining	1987	1,847	2003	3,660
In-Situ	1988	60	1988	35
Peak Requirements	1987	1,877	2003	3,695
UNITIZED DEVELOPMENT				
Peak Requirements	1997	475	2003	2,465

CHAPTER 2

COMPARATIVE ANALYSIS



CHAPTER 2
COMPARATIVE ANALYSIS

This chapter compares the impacts of the proposed actions to 3 alternatives: the partial conversion alternative and/or special mitigation, the unitized development alternative, and the no action alternative. For a description of the proposed actions, see Chapter 1.

The differing environmental impacts of the proposed actions and alternatives are compared and summarized in Table 2-1. The comparative analysis is based on impact analysis and significance criteria in Chapter 3, as well as information contained in Chapter 4.

TABLE 2-1
SUMMARY COMPARISON OF IMPACTS OF THE PROPOSED ACTIONS AND ALTERNATIVES

	Proposed Actions			Partial Conversion			Unitized	No-Action
	Collective	Interrelated	Cumulative	Collective	Interrelated	Cumulative		
Mineral Resources								
Total Production (b/bbl)	2.6	.2	2.8	1.1	.2	1.3	1.6	.2
Oil Production (bpd)	115,000	10,000	125,000	80,000	10,000	90,000	50,000	10,000
Conversion Related Processing Plants (number)[a]	5+2	1	6+2	2	1	3	1	1
Land Disturbance								
Total Disturbance (acres)[b]	35,945	2,900	38,845	21,318	2,900	24,218	38,845	2,900
Disturbed at any one time (acres)[b]	6,500 for 40 years	550 for 25 years	6,500 for 40 years with 7,050 peak	5,000 for 25 years	550 for 25 years	5,000 for 25 years with 5,550 peak	3,500 for 60 years	550 for 25 years
Project Life (years)[c]	74	35	74	49	35	49	94	35
Water Resources								
Water Use (ac-ft/yr)	35,845	4,500	40,345	20,738	4,500	25,238	18,840	4,500
Special Watershed Management Areas (acres)	3,960	2,560	6,520	1,280	2,560	3,840	6,520	2,560
Springs Affected	37	8	45	16	8	24	45	8
Potential to Exceed State Water Quality Standards	high	high	high	moderate	moderate	moderate	high	low
Socioeconomics								
Steady-state operation population increase, year 2005	23,710	21,330	45,040	17,840	21,330	39,170	12,140 (31,290)[d]	21,330
Employment	9,750	9,030	18,780	7,360	9,030	16,390	4,930 (13,070)[d]	9,030
Local Government Finances (percent of excess of costs over revenues)	•	•	20	•	•	20	15	•
Soils and Vegetation								
Disturbance in Climatic Zone B (acres)	0	1,000	1,000	0	1,000	1,000	6,820[e]	1,000
Disturbance in Climatic Zone C (acres)	1,838	200	2,038	4,141	200	4,341	267	200
Disturbance in Very Steep Terrain (acres)	26,172	1,223	27,395	10,722	1,223	11,945	21,862	1,223
Wildlife								
Mule Deer Herd (total acres of habitat lost)	32,296	1,400	33,696	21,318	1,400	22,718	33,696	1,400
Unit 27B Reduction (percent of herd)	12	1	13	8	1	9	13	1

TABLE 2-1 (Concluded)
SUMMARY COMPARISON OF IMPACTS OF THE PROPOSED ACTIONS AND ALTERNATIVES

		Proposed Actions			Partial Conversion			Unitized	No-Action
		Collective	Interrelated	Cumulative	Collective	Interrelated	Cumulative		
Air Quality									
Potential Maximum Average Concentrations									
PSD Increments Class II ($\mu g/m^3$)									
SO_2 3-hour	512	exceed	not exceed	exceed	exceed	not exceed	exceed	not exceed	not exceed
24-hour	91	exceed	not exceed	exceed	exceed	not exceed	exceed	exceed	not exceed
Annual	20	not exceed	not exceed	not exceed	exceed	not exceed	exceed	not exceed	not exceed
TSP 3 hour	37	exceed	exceed	exceed	exceed	exceed	exceed	exceed	exceed
Annual	19	exceed	exceed	exceed	exceed	exceed	exceed	exceed	exceed
NAAQS ($\mu g/m^3$)									
SO_2 3-hour	1,300	not exceed	not exceed	not exceed	not exceed	not exceed	not exceed	not exceed	not exceed
24-hour	365	not exceed	not exceed	not exceed	not exceed	not exceed	not exceed	not exceed	not exceed
Annual	80	not exceed	not exceed	not exceed	not exceed	not exceed	not exceed	not exceed	not exceed
TSP 24-hour	150	exceed	exceed	exceed	exceed	exceed	exceed	exceed	exceed
Annual	60	exceed	not exceed	exceed	exceed	not exceed	exceed	exceed	not exceed
NO^2 Annual	100	exceed	not exceed	exceed	exceed	not exceed	exceed	not exceed	not exceed
Transportation									
Total Vehicle Trips Per Day		Many road segments exceed the level of service C.	Few road segments exceed the level of Service C.	Same as Collective	NA	Few road segments exceed the level of service C.	Same as Interrelated	Few road segments exceed the level of service C.	NA
Tonnage Transported (million gross tons)		Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action
Visual Resources									
Significantly Affected Class II Area (acres)		18,932	1,400	20,332	9,716	1,400	11,116	20,332	1,400
Significantly Affected Class III Area (acres)		7,268	0	7,268	3,568	0	3,568	7,268	0
Significantly Affected Class IV Area (acres)		4,050	1,200	5,250	4,827	1,200	6,027	5,250	1,200
Undetermined (acres)		2,445	300	2,745	1,855	300	2,155	2,745	300
Agriculture									
Grazing Loss (AUMs/year)		387	22	409	279	22	301	344	22
Cropland Converted to Urban Use (acres)		933	UNK	UNK	699	UNK	UNK	475	UNK
Number of Allotments Affected		12	0	12	6	0	6	6	0
Wilderness									
Impacts to the wilderness resource and quality of the wilderness experiences in Desolation and Turtle Canyon WSAs		Effects on trout in Range Creek (wilderness Value)	None	Slightly greater than collective	Minimal	None	Minimal	Same as Proposed Action	None

TABLE 2-1 (Concluded)
SUMMARY COMPARISON OF IMPACTS OF THE PROPOSED ACTIONS AND ALTERNATIVES

	Proposed Actions			Partial Conversion			Unitized	No-Action
	Collective	Interrelated	Cumulative	Collective	Interrelated	Cumulative		
Recreation								
Impacts to the recreation land base and quality of recreation experiences	Overall recreation quality diminished (i.e., scenic quality, naturalness, semi-primitive experience); elimination of a portion of the Green River as a potential Wild and Scenic River	None	Same as Collective	Less impact to overall recreation quality due to no lease activity at Bruin Point and Range creek Elimination of a small portion of the Green River as a potential Wild and Scenic River	None	Same as Collective	Less impacts to big game hunting quality due to fewer acres disturbed at any one time and less project-induced population growth	None

Note: ac-ft/yr = acre-feet per year; AUM = animal unit month; b/bbl = billion barrels; D&RGW = Denver and Rio Grande Western Railroad NA = not applicable $\mu g/m^3$ = micrograms per cubic meter UNK = unknown.

*Unknown at this time; data will be provided in the Final EIS.

[a]Each applicant has proposed 1 main plant. In addition, Mono has proposed 2 secondary mill sites.

[b]Disturbed refers to total area that would be disturbed during construction and operation.

[c]Project life refers to the total years that would be required for construction, operation-production, abandonment, and reclamation.

[d]Figures in parentheses represent cumulative impacts of the unitized development alternative plus the interrelated coal mines.

[e]More spent sand disposal areas located outside the STSA boundary.

The proposed actions consider the maximum conversion acreage and the most processing plants operating over a moderate period of time; the partial conversion alternative considers the least conversion acreage, a reduced number of processing plants, and a shortened period of commercial operation; the unitized development alternative considers the maximum conversion acreage, but assumes the longest commercial operation period because only one processing plant is involved. Figure 2-1 graphically illustrates significant differences among the proposed actions and alternatives in terms of acres of land disturbed at one time.

2.A PARTIAL CONVERSION ALTERNATIVE AND/OR SPECIAL MITIGATION

The partial conversion alternative and/or special mitigation (referred to as partial conversion alternative) assumes that only a portion of the leases would be approved for conversion. Actual tar sand development would proceed as proposed under the 5 plans of operations, but only on those leases that would be approved for conversion. Consequently, only 80,000 barrels per day (bpd) of equivalent crude oil would be produced. Project life would be 49 years instead of 74 years as under the proposed actions, allowing for approximately 1.1 billion barrels of production. This represents 31 percent of the estimated resources available in the Sunnyside Special Tar Sand Area (STSA) (as compared to 74 percent for the proposed actions). The conversion area tar sand would be processed in 2 processing plants instead of 5, as described in Chapter 1.

The total acres disturbed within the STSA as a result of this alternative would be less than for the proposed actions; disturbance would occur over a shorter period of time. Only 5,000 acres on the average would be disturbed at any one time during steady-state commercial operations. Consequently, the environmental impacts associated with land disturbance would be less than for the proposed actions. The impacts to soils, vegetation, wildlife, recreation, wilderness study areas, visual resources, agriculture, paleontology, and cultural resources would be less than for the proposed actions as shown on Table 2-1. Impacts to agriculture (grazing) would be minimized due to the exclusion of surface mining on critical areas of grazing land and areas of critical livestock water sources that provide water for large livestock grazing units.

The impacts to watersheds would be significantly reduced under this alternative as compared to the proposed actions. This is due to not converting leases in portions of Grassy Trail Creek and Range Creek watersheds. Both of these watersheds are presently used or have the potential to be used as culinary water supplies. Under this alternative, the quality of the water would change little, if any, in these watersheds.

The impacts to air quality would be greater for SO_2 and TSP concentrations as compared to the proposed actions. The SO^2 concentrations would be higher because of the higher production level at the stack which gives the maximum concentration value. The TSP concentrations would be higher because of mines producing at a higher rate. The Sunnyside STSA would remain a non-attainment area (exceeding NAAQS) for the life of the projects, similar to the proposed actions.

The socioeconomic impacts to the area would be less than for the proposed actions as the labor force needed would be slightly less. In addition, there would be fewer impacts to transportation networks.

2.B UNITIZED DEVELOPMENT ALTERNATIVE

The unitized development alternative assumes that all of the leases applied for conversion under the proposed actions would be approved, but the actual rate of tar sand development would be reduced. Instead of producing a total of 115,000 bpd of crude oil under the five plans of operations, only 50,000 bpd of crude oil would be produced under one unitized plan of operation. A project life of 94 years is projected, as compared to 74 years for the proposed actions, allowing for 1.6 billion barrels of production. This represents 46 percent of the estimated resources available in the STSA. The recovered tar sand would be processed in one processing plant, as described in Chapter 1.

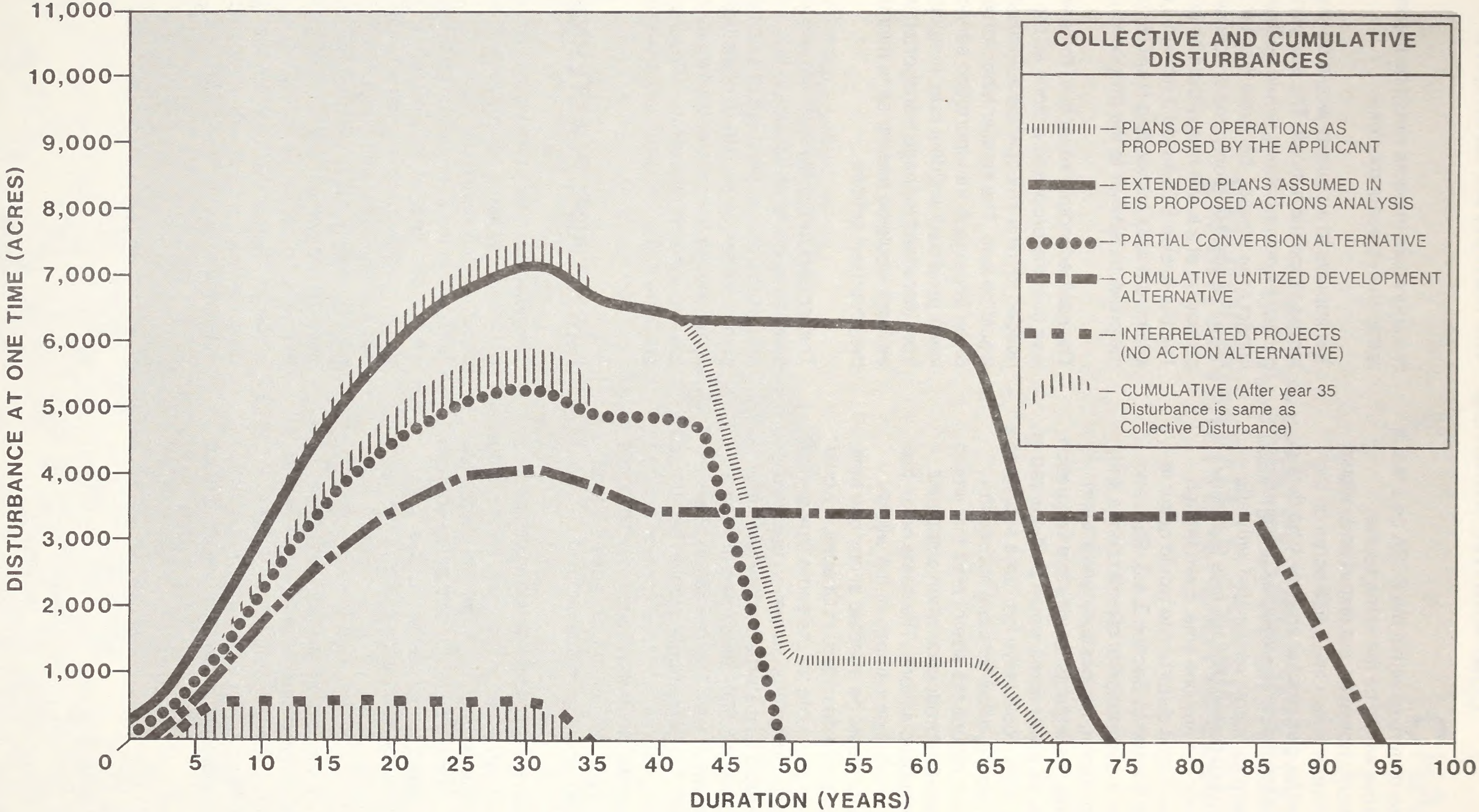


FIGURE 2-1 COLLECTIVE AND CUMMULATIVE LAND DISTURBANCE

The total acres disturbed within the STSA as a result of this alternative would be the same as the proposed actions; however, the disturbance would occur over a longer time. Only 3,500 acres on the average would be disturbed at any one time during steady-state commerical operations. Consequently, the environmental impacts associated with land disturbance would be significantly less than the proposed actions at any one time. Even though more acreage of land disturbance would occur in Climatic Zone B (refer to Section 3.A.3, Soils and Vegetation for a description of climatic zones and Map 3-2, map pocket, for location) (spent sand disposal areas), the impacts to soils and vegetation would be less, as fewer acres would be disturbed at any one time. This would leave less area subject to a high erosion hazard, allow for more successful reclamation and reduce the size of area that would be out of vegetative production when compared against the proposed actions. The same holds true for wildlife. A smaller percentage of the wildlife species present would be affected at any one time. Mitigation measures described in Chapter 4 would reduce impacts to wildlife for the same time periods as for the proposed actions. However, because fewer acres would be disturbed at any one time (3,500 acres versus 6,500) the degree of impact would be somewhat less. The recreation activities associated with big game hunting would be affected to a slightly less degree. The total impacts to these resources over the life of the projects would be the same as the proposed actions, because the total acres disturbed would be the same.

There would be no significant difference in impacts to wilderness study areas, agriculture, paleontology, or cultural resources resulting from this alternative as from the proposed actions. For these resources, the greatest impact would be from total land disturbance which would be the same as the proposed actions.

The impacts to watersheds are expected to be similar for the unitized development alternative to those for the proposed action; however, these impacts would occur over a longer period of time and would be slightly less in magnitude. As a result, the aggregate impacts would be theoretically less, rather than measurably less.

The impacts to air quality would be slightly less than for the proposed actions. The surrounding air pollutant concentrations would be less and the impact area smaller, because less tar sand would be mined per year and only one processing plant, producing at a lower rate, would be in production. The Sunnyside STSA would remain a non-attainment area (exceeding NAAQS) for the life of the projects, similiar to the proposed actions.

The socioeconomic impacts to the area would be less than the proposed actions as the labor force needed to mine and operate a unitized development would be less. The smaller labor force would cause fewer impacts to transportation services and have a lower projected accident rate. In addition, impacts from increased tonnage transported would be less, as there would be less tar sand mined per year than the proposed actions.

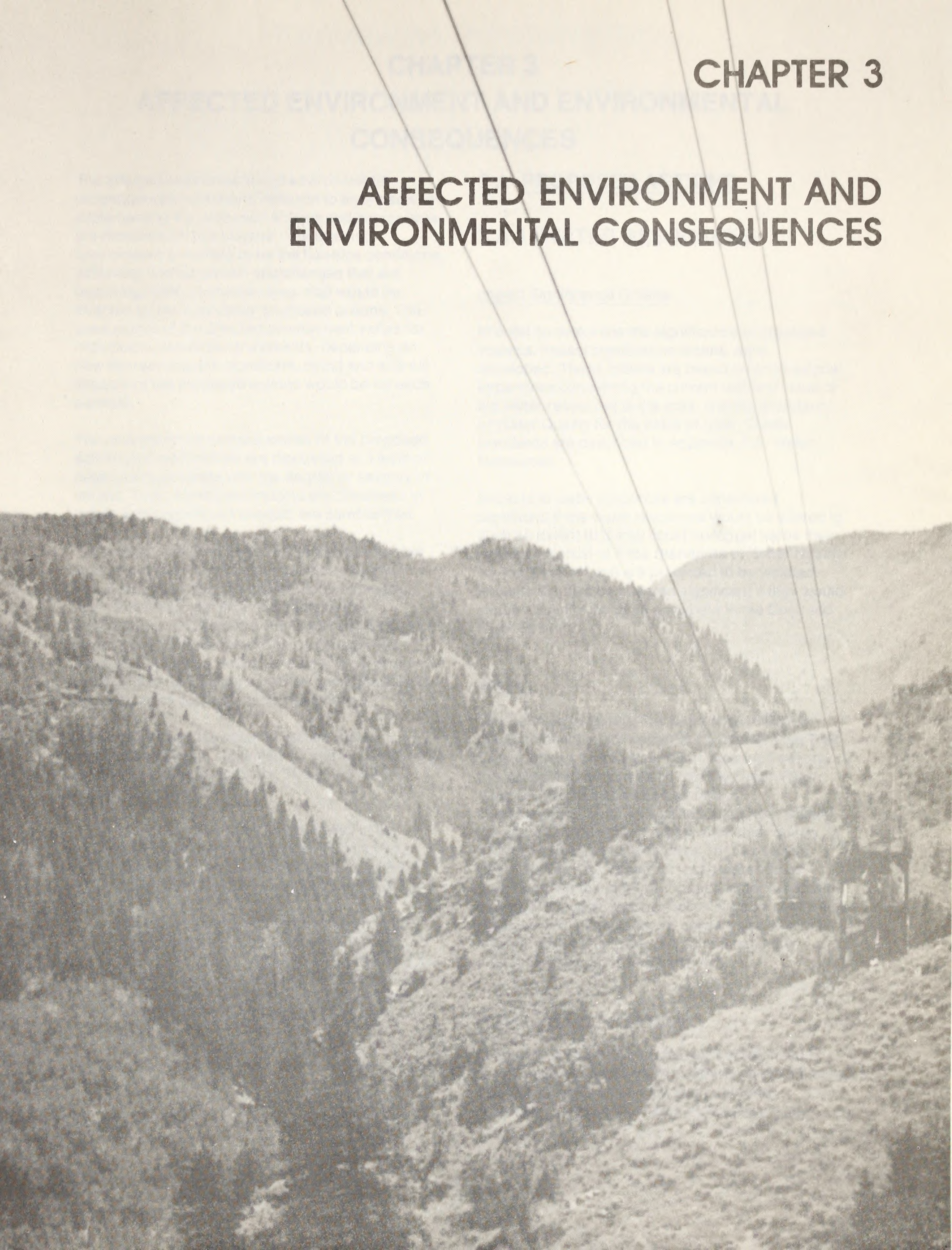
The impacts to visual resources resulting from this alternative would be similiar to those for the proposed actions. Because of a unitized mining plan, the short-term pattern of disturbance would be an advancing front rather than small patches from several concurrent projects. The long-term impacts are expected to be essentially the same.

2.C NO ACTION ALTERNATIVE

The no action alternative would involve denial of all the requested lease conversions. It is assumed that no tar sand development would occur on federal lands within the Sunnyside STSA. The impacts to water, soils, vegetation, wildlife, visual resources, air quality, socioeconomics, transportation networks, cultural resources, and agriculture would be less than for the proposed actions. The only tar sand development would be from interrelated projects that would produce the equivalent of 10,000 bpd of crude oil. This would represent approximately .2 billion barrels, or 6 percent of the resources estimated to occur in the STSA.

CHAPTER 3

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES



CHAPTER 3
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

The affected environment and environmental consequences (commonly referred to as impacts) of implementing the proposed actions and alternatives are discussed in this chapter. The affected environment is defined to be the baseline conditions, assuming normal growth and changes that are occurring in the Sunnyside area, that would be affected by the applicants' proposed actions. The areal extent of the affected environment varies for individual environmental elements, depending on how far-reaching the significant, direct and indirect impacts of the proposed actions would be for each element.

The environmental consequences of the proposed actions and alternatives are discussed at a level of detail commensurate with the degree or severity of impact. Thus, significant impacts are discussed in detail, and insignificant impacts are summarized.

The impact analyses presented in this chapter are limited to the commercial phase of development. It was determined that the exploration phase would not result in any significant impacts to the environment. The impacts of the test mine and pilot plant phase of development are not presented, because this phase would be temporary and of short duration and its impacts would be encompassed by the impacts of commercial development.

The impact analyses assume certain types of mitigation would be implemented that would alleviate or minimize adverse impacts. These types of mitigation include:

- Mitigation measures incorporated in the applicants' proposed plans of operations. These measures are committed to by the applicants and are described in Section 1.D.2.

- Mitigation measures enforceable on lands administered by federal, state, and local agencies. These measures are committed to by these agencies for enforcement only on lands where the respective agencies have jurisdiction. They are described in Appendix A-3.

3.A PROPOSED ACTIONS

3.A.1 WATER RESOURCES

Impact Significance Criteria

In order to determine the significance of predicted impacts, impact significance criteria were developed. These criteria are based on professional experience concerning the current use and value of the water resources in the area, and the Standards of Water Quality for the State of Utah. These standards are described in Appendix A-5, Water Resources.

Impacts to water resources are considered significant if the water resources would be altered to such an extent that they could no longer serve their existing function or if the Standards of Water Quality for the State of Utah are predicted to be violated. Impacts are also considered significant if they would cause a salinity increase anywhere in the Colorado River System.

Setting

The Sunnyside Special Tar Sand Area (STSA) is made up of 4 distinct watershed areas: Grassy Trail Creek, Range Creek, Nine Mile Creek, and several tributaries that drain directly into the Green River. Each of these watersheds has distinct characteristics, such as number of springs, special watershed management areas, and water quality. In addition to these characteristics, the Sunnyside STSA covers headwaters of these watersheds which nourish the streams in these watersheds with high quality water, some of which support cold water fisheries and are suitable for culinary use with only minimal treatment. Table 3-1 summarizes the characteristics of the 4 watersheds.

Grassy Trail Creek Watershed

Grassy Trail Creek Watershed is characterized by steep slopes, a deeply incised stream system that is capable of rapidly moving water out of the headwaters, and is in an area of relatively high

TABLE 3-1
SUMMARY OF WATERSHED CHARACTERISTICS

Parameter	Grassy Trail Creek	Range Creek	Nine Mile Creek	Green River Tributaries	Total
Tributary to	Price River	Green River	Green River	Green River	NA
Acres of Main Block of STSA Drained	15,592	11,769	47,076	23,539	98,976
Acres of Public Water Reserve	760	0	2,920	0	3,680
Acres of Water Supply Reserve	45	2,201	116	38	2,400
Number of Springs[a]	23	3	85	35	146
Use Designation Class	1C, 3A, 4	1C, 3A, 4	3A, 4	1C, 2B, 3B, 4	NA
Acres of Special BLM Watersheds[b]					
Bear and Rock Creeks	NA	NA	NA	1,960	1,960
Jack Creek	NA	NA	NA	1,266	1,266
Range Creek	NA	1,442	NA	NA	1,442
Acres Covered by Disposal Areas	1,000 (Chevron) 1,000 (Enercor) 1,327 (Mono)	750 (Amoco) 850 (Mono)	750 (Amoco)	0	5,677
Floodplains	Left and Right Fork Grassy Trail Creeks	Range Creek	Dry Creek	Jack Creek	5

Note: NA = not applicable.
[a]Number of springs determined from maps on file at the Price River Resource Area office.
[b]See Appendix A-5, Water Resources, for a description of Use Designation Classes and special watershed management areas.

precipitation. Grassy Trail Creek drains 15,592 acres of the main block of the Sunnyside STSA and is a tributary to the Price River. It contains 760 acres of public water reserve and 45 acres of water supply reserve. (For a description of these special watershed management areas, see Appendix A-5, Water Resources.) The watershed also has 23 springs.

On Grassy Trail Creek and immediately outside the STSA boundary is Grassy Trail Reservoir. The reservoir was constructed as a joint venture of U.S. Steel and Kaiser Steel in 1952, and was used as a source of process water and as a municipal water supply for the company town of Sunnyside, Utah. Currently, the 991-acre-feet (ac-ft) reservoir supplies water to Sunnyside and other downstream communities. The water requires only chlorination for culinary use. However, a recognized problem in this watershed is sedimentation. It is estimated from Utah Fish and Game Department measurements that Grassy Trail Reservoir contains 200 ac-ft of sediment; therefore, sediment has been accumulating at a rate of 6.67 acre-feet per year (ac-ft/yr) (Pressett 1983).

Located in this watershed, but downstream and outside of the STSA boundary, would be 3 proposed spent sand disposal areas totaling 3,327 acres. This watershed has Use Designation Classes 1C, 3A, and 4 (Appendix A-5).

The potential exists for the applicants' proposed developments to collectively disturb 9,444 acres in the Grassy Trail Creek Watershed. Applicant-proposed development plus the interrelated projects cumulatively would disturb 12,293 acres in the watershed (Table 3-2). These disturbances are both expected to have similar impacts. Such disturbance

TABLE 3-2
SUMMARY OF WATERSHED IMPACTS
(Proposed Actions)

Watershed	Land Disturbance (acres) Collective	Land Disturbance (acres) Cumulative	Potential to Exceed State Standards	Springs Total in Watershed	Springs Number Affected	Deep Aquifer	Floodplains	Other
Grassy Trail Creek	9,444	12,293	Very high	23	23	Decrease in discharge due to dewatering	Major topographic alteration	Deterioration of water quality and water supply in Grassy Trail Reservoir; TDS increase due to spent sand area and increased erosion
Range Creek	4,260	4,311	High	3	1	Little or no change in discharge	Minor topographic alteration	TDS increase due to spent sand area and increased erosion
Nine Mile Creek	22,075	22,075	High	85	39	Little or no change in discharge	Minor topographic alteration	TDS increase in tributary streams; Little or no change in TDS at mouth of Nine Mile Creek
Tributaries to Green River	166	166	Very low	35	0	Little or no change in discharge due to neighboring mining	No topographic alteration	—

Note: TDS = total dissolved solids.

would greatly alter the hydrologic regime, which would threaten the existing use of this watershed as a water source for downstream communities.

Currently, soil erosion in the watershed averages 2.9 tons per acre (tons/acre), a relatively small amount for an area with such steep terrain and high precipitation. Erosion rates on bare ground, spoil piles, mine surfaces, and haul roads could reach 49 tons/acre. (This may be an unrealistic amount, since it considers no erosion control practices. However, even with intense erosion control practices, soil loss is expected to increase to 6.9 tons/acre on the disturbed areas, a 238 percent increase.) For a detailed discussion of erosion rates and reclamation procedures, see Appendix A-7, Reclamation and Erosion Control Programs.

The significance of this accelerated erosion is a deterioration in water quality. Although no actual sediment concentrations can be determined, the relative importance of increased erosion can be demonstrated. Currently, sediment is accumulating in Grassy Trail Reservoir at a rate of 10,520 tons/year, with an additional 2,630 tons/year passing through the reservoir in suspension (see Appendix A-5, Water Resources). Increasing soil erosion by 238 percent on the disturbed acreage conservatively would double the sediment in the Left and Right Forks of Grassy Trail Creek. Given this type of soil erosion and resulting sedimentation, the loss in capacity of the Grassy Trail reservoir through the life of the projects would result in it no longer being a reliable water source. In addition to losing capacity, water temperatures would increase, as would concentrations of suspended sediment in the reservoir.

Increased sedimentation and turbidity would violate aquatic wildlife Class 3A (for a further discussion of impacts to aquatic wildlife, see Section 3.A.4, Wildlife) and would probably be outside the acceptable limits for a domestic water source (Class 1C) due to sediment levels being increased for longer periods of time than is currently being experienced. Furthermore, total dissolved solids (TDS) concentrations would be expected to increase from a current level of 250 to 451 milligrams per liter (mg/l) to a level of 1,000 mg/l, as is now experienced in most of the wells in the Green River Formation. Such an increase would exceed the Standards of Water Quality for the State of Utah for surface waters.

Included in the 12,293 acres of disturbance are 3 spent sand disposal areas. These areas would not contribute to sediment accumulations in Grassy Trail Reservoir or deteriorate its water quality, because the areas are downstream from the reservoir. The areas are, however, a concern based upon the potential for leachate to reach the Grassy Trail Creek and eventually the Price River. Test data obtained from the applicants indicate that the spent sand is not a hazardous waste. Furthermore, construction practices of slope stabilization, compaction, and reclamation would eliminate the risk of mass failure. Precipitation that enters the disposal piles may leach through them during and after the life of the projects. These leachates are expected to have TDS between those of the shale areas and those in the STSA. Due to this, there could be some increases in TDS concentrations.

Ground water in the area would be affected by the loss of 23 springs and a decrease in deep aquifer flow to the Green River and Nine Mile Creek. The loss of the springs would be due to actual removal of the strata that now feeds them. The water in these springs would not be lost from the area, but would be in surface flow. Such increases in surface flow would increase peak flows in Grassy Trail Creek; however, these increases would not be noticeable. The changes in deep aquifer water flow would result primarily from mine dewatering. Because ground water in these aquifers is high in TDS concentrations, streams (Right and Left Forks of Grassy Trail Creek) that are dewatering discharge sites would show a corresponding increase in these parameters.

Floodplains in the watershed would be highly altered; in some cases, they would be eliminated. During actual mining, peak flows are expected to increase due to removal of the vegetation, compaction of the soil surface, and mine dewatering. However, after mining and successful reclamation is completed, these peaks are expected to be less than present levels, because steep slopes would be reduced in numbers and extent.

Overall, the impacts associated with tar sand resource recovery would significantly affect the existing water uses in the Grassy Trail Creek Watershed.

Range Creek Watershed

Range Creek Watershed, like Grassy Trail Watershed, is characterized by steep slopes, a deeply incised stream system, and high precipitation. As shown in Table 3-1, Range Creek drains 11,769 acres of the main block of the Sunnyside STSA and is a tributary to the Green River. It contains 0 acres of public water reserve and 2,201 acres of water supply reserve. (For a description of these special watershed management areas, see Appendix A-5, Water Resources.) The watershed also has 3 springs. Some 1,442 acres of the Range Creek Watershed have been designated by the Bureau of Land Management (BLM) as a watershed that has outstanding resource values, including a trout fishery. A proposed disposal area would occupy most of the headwaters of Range Creek while leaving the upper 1 mile in a natural condition. Another disposal area would be downstream on Range Creek and outside of the STSA boundary. Total acreage of the spent sand disposal piles would be 750 acres at the headwater site and 850 acres outside of the STSA boundary.

Utah state water quality laws classify stream segments for certain uses, based on current uses and the quality of the water. The stream segments in this watershed have Use Designation Classes 1C, 3A and 4 (for a description of these classes, see Appendix A-5).

The potential exists for the applicants' proposed developments to collectively disturb 4,260 acres in the Range Creek Watershed. Applicant-proposed development plus the interrelated projects cumulatively would disturb 4,311 acres in the watershed (Table 3-2). These disturbances are expected to have similar impacts. Such disturbance would essentially leave the headwaters (upper 1 mile) of Range Creek in its natural state; however, downstream from the headwaters, the water regime would be altered.

Increases in soil erosion in the watershed due to mining activity would be similar to those for the Grassy Trail Creek Watershed; the rate of erosion would approximately double on the disturbed areas. This increase in sediment would increase TDS levels, suspended sediment, and water temperature. The probability of exceeding Standards of Water Quality for the State of Utah for this stream segment is not as high as it is in Grassy Trail Creek Watershed stream segments; however, the standards are still expected to be exceeded. This is

because there would be less disturbance within the watershed and the disturbance would be concentrated in 3 distinct areas (Map 3-2, map pocket).

The spent sand disposal area proposed by Mono for Range Creek Watershed would be a valley fill that would completely occupy a wash formed by an unnamed tributary. According to the applicant's plan of operations (Mono 1982), a stable, earthen dam would be constructed with normal compacted earth procedures. It then would be filled with progressive lifts and compacted. Normal precipitation could produce free water that would drain directly into Range Creek. This water would have slightly increased levels of TDS. In addition to these water impacts, Range Creek has been identified as a potential water source. If the 5,000 ac-ft/yr of process water is withdrawn from Range Creek, it is possible that from the STSA boundary downstream there would be no water flow.

The ground water in Range Creek Watershed would be altered only slightly. One spring is expected to be lost or have its flow diminished. Similarly, little water is expected to be diverted from deep aquifer movement due to dewatering because of the entrenched nature of Range Creek, its interception of ground water, and the occurrence of the tar sand deposits.

Floodplains in the watershed would be altered due to changes in the surrounding topography. The mining process would remove hills and create rolling to flat plateaus. Upon reclamation, this would reduce slope and reduce discharges; however, during mining, slight increases over normal flood levels can be expected.

Overall, the impacts associated with tar sand resource recovery would significantly affect the existing water uses in the Range Creek Watershed.

Nine Mile Creek Watershed

That portion of Nine Mile Creek Watershed which lies within the STSA boundary does not have an abundance of steep slopes. The topography is more rolling and the precipitation is lower than in the Grassy Trail Creek or Range Creek Watersheds. As shown in Table 3-1, Nine Mile Creek drains 47,076 acres of the main block of the Sunnyside STSA and is a tributary to the Green River. It contains 2,920 acres of public water reserve and 116 acres of water supply reserve. (For a description of these special watershed management areas, see Appendix A-5, Water Resources.) The watershed also has 85 springs. A portion of a proposed spent sand disposal area would occupy 750 acres of the uppermost reaches of this watershed.

The stream segment in this watershed has Use Designation Classes 3A and 4 (for a description of these classes, refer to Appendix A-5).

The potential exists to collectively and cumulatively disturb 22,075 acres in Nine Mile Watershed (Table 3-2). Because Nine Mile Creek occupies such a large watershed, the changes to water resources from tar sand recovery probably would not make a noticeable difference at the mouth; however, resource recovery would cause much surface disturbance, approximately 70 percent of which would be associated with in-situ recovery and 30 percent which would be associated with surface mining. The combination of disturbance from these recovery processes is expected to change water resources in a different manner than would surface mining alone. For example, surface roughness, tracks and depressions caused by machinery, and rock debris and ground-up vegetation from in-situ resource recovery would form many depressions that could catch water and retain sediment. In addition to this, the absence of spent sand disposal piles and open pit mines would not expose soil to erosion.

Because of the proposed recovery methods, soil erosion is expected to increase less in this watershed than in watersheds where predominately surface mining would occur. Consequently, TDS are expected to increase less than in Grassy Trail Watershed; similarly, sediment and resulting turbidity would be less in Nine Mile Creek Watershed.

The Water Quality Standards for the State of Utah for aquatic wildlife Class 3A are expected to be exceeded in tributaries to Nine Mile Creek; however, these increases would be during rare events such as thunderstorms and unusually high spring runoff. Even though the standards are currently exceeded during these events, the period of high sediment concentration levels is expected to be longer and, therefore, would violate the standards.

Ground water in the area primarily would be affected by the loss of springs and surface compaction, which could decrease the flow of some springs. Of the 85 springs in the watershed, 24 would be lost

due to surface mining. These springs are in the western most portion of the watershed. Fifteen springs in the eastern part of the watershed could experience some decrease in flow due to compaction and in-situ recovery. The deep ground water aquifers would not be affected; although, great quantities of water in the form of steam would be injected. The majority of this water would be recovered by subsequent pumping. A portion of that which would not be recovered would be absorbed into the tar sand bearing formations. Other unrecovered waters would eventually discharge through natural, existing ground water flow patterns.

Floodplains in the watershed would not be greatly altered, because steep canyons do not exist and, therefore, the water has more room to flow. Nine Mile Creek Watershed is also in an area that receives lower amounts of precipitation, and flooding is buffered by the large main stream. Because of the nature of this watershed, flood discharge peaks are not expected to significantly change.

Overall, the impacts associated with tar sand resource recovery would significantly affect the existing water uses in the Nine Mile Creek Watershed.

Watersheds Tributary to the Green River

The series of tributaries that drain directly into the Green River have topographic and precipitation characteristics similar to those of the Nine Mile Creek Watershed. These streams drain 23,539 acres of the main block of the Sunnyside STSA. This area contains 0 acres of public water reserve and 38 acres of water supply reserve. Some 1,960 acres of Bear and Rock Creeks Watershed and the headwaters of 1,266 acres of Jack Creek Watershed are within this area. These watersheds have been designated by the BLM as important quality watersheds that have outstanding values. (For a description of these special watershed management areas, see Appendix A-5, Water Resources.) The watershed also has 35 springs. No spent sand disposal sites are proposed for this watershed.

The streams that occupy the watersheds tributary to the Green River have Use Designation Classes 1C, 2B, 3B and 4 (for a description of these classes, see Appendix A-5).

The potential exists to collectively and cumulatively disturb 166 acres in the watersheds tributary to the Green River. Such disturbance would have almost no noticeable effect on TDS, sediment concentrations, or changes in flow. Due to the small amount of surface disturbance and absence of spent sand disposal areas, Utah Water Quality Standards would not be exceeded for any given use.

Ground water in the area would be unaffected by the proposed activities in the watershed; however, neighboring mining activities in Range Creek and Nine Mile Creek Watersheds could decrease yields to some wells in the watersheds tributary to the Green River. This would be due to interruption of ground water flow prior to it migrating into the watershed.

Floodplains in this watershed would not be affected by the proposed mining activities.

Overall, the impacts associated with tar sand resource recovery would significantly affect the existing water uses in the watersheds tributary to the Green River.

Summary of Watershed Impacts

Implementation of the proposed actions has the potential to significantly alter the water resource within the main block of the Sunnyside STSA. Because the water sources that would be affected are in the headwaters of the streams, the impacts discussed probably would not be noticeable at the mouths of these streams. However, the poorer water quality conditions presently experienced in the mouth areas would extend further upstream. Table 3-2 summarizes the local impacts by individual watersheds.

Special Watershed Management Areas

The 2,400 acres of public lands set aside as a water supply reserve for Sunnyside, Utah, are "reserved from all forms of location, entry, or appropriation whether under the mineral or nonmineral land laws." This is "for the purpose of storing, conserving, and protecting from pollution the said water supply, and preserving, improving, and increasing the timber growth." However, the Secretary of the Interior may allow deposits of coal or other minerals to be leased

if "he shall find that same may be mined and removed without injury to the municipal water supply of Sunnyside, Utah (Public Law (P.L.) 294)."

Based on the impacts previously discussed for Range Creek Watershed (which contains almost all of the water supply reserve), the storage and conservation of water in the watershed would greatly diminish during and after any mining operation. Similarly, water quality would degrade from increased suspended sediments and higher TDS levels.

Because of the deteriorating water quality, a mining operation as proposed for the water supply reserve in Range Creek Watershed would appear to conflict with the intent of the law. There is, however, a provision in P.L. 294 that allows leasing of the water supply reserve if the municipal water supply of Sunnyside, Utah, is not injured. Because the water supply reserve in Range Creek is currently not supplying the municipal needs of Sunnyside it would appear that leasing would not be in conflict with the intent of the law. However, the possibility does exist that the community of Sunnyside may call upon the water supply reserve for a municipal need at some point in the future. At that time, the lessee may be called upon to supply water for these municipal needs. Such a request for municipal water would be well within the rights of Sunnyside and consistent with the intent of the law. As stated in R 779.17 and 816.54, the applicants have the responsibility to "identify the alternative sources of water supply that could be developed to replace the existing sources." (For a further discussion of this issue, see the Unresolved Issues section of the Summary.)

The 3,680 acres of public lands withdrawn for public water reserves within the STSA were set aside by President Woodrow Wilson under Public Land Order Number 16, dated March 19, 1919. This withdrawal was made under authority of the General Withdrawal Act of June 25, 1910, commonly referred to as the Pickett Act (36 Sect. 847). The Pickett Act states "that the President may, at any time in his discretion, temporarily withdraw from settlement, location, sale, or entry any of the public lands in the United States, including Alaska, and reserve the same for water-power sites, irrigation, classification of lands, or other public purposes to be specified in the orders of withdrawals, and such withdrawals or reservations shall remain in force until revoked by him or an Act of Congress."

Lands withdrawn under the Pickett Act, unless otherwise specifically provided in the withdrawal order, are open to leasing under the Mineral Leasing Act of 1920 at the discretion of the Secretary of the Interior, if the issuance of a lease will not be inconsistent with or materially interfere with the purposes for which the land is withdrawn (Rocky Mountain Mineral Law Foundation).

Public Land Order 16 was made to reserve in public ownership the springs and watering places described in the withdrawal. The withdrawal did not preclude mineral leasing. Thus, combined hydrocarbon leases may be issued with stipulations which would protect the water source.

The other (Bear and Rock creeks, and Range Creek) special watershed management areas represent a management conflict that could be mitigated or avoided by careful management and stipulations.

The extent of potential conflicts with special watershed management areas are shown in Table 3-3.

TABLE 3-3
POTENTIAL CONFLICTS WITH SPECIAL WATERSHED MANAGEMENT AREAS

Management Area	Total Acreage Affected[a]
Public Water Reserve	2,280
Water Supply Reserve	1,760
Bear and Rock Creeks Watersheds	0[b]
Range Creek Watershed	0

[a]Conversion area acreage.
[b]Although there is no direct surface disturbance in these watersheds, some water quality deterioration could result from upstream activities.

Water Supply and Salinity Impacts

Water required for exploration, the pilot plant, and commercial operation would represent depletions from the Colorado River System. The amount of water that would be used and the source of this water are listed in Tables 1-7 (located in Chapter 1) and 3-4. The water used for exploration (5 ac-ft/yr) would be a very small amount and readily available within the Sunnyside area.

Similarly, the 1,108 ac-ft/yr associated with the pilot plant stage is available locally. The water for these 2 phases of a tar sand industry would not significantly affect the water bodies used as sources, nor would they have any measurable changes in flow or salinity on the Colorado River System. Due to this, they will not be discussed further.

Water use associated with actual commercial operation would cause depletions in 3 streams—Range Creek, the Price River, and the Green River (Table 3-4). Although no gauges are present on Range Creek, the average annual flow can be estimated from precipitation and drainage area. Based upon this method, the amount of water that can be expected from Range Creek would not exceed 5,000 ac-ft/yr. Water quality is good with TDS values ranging from 200 mg/l to 600 mg/l.

The Price River, for the past 35 years, has had an average annual flow of 74,620 ac-ft, as measured at Woodside, Utah. The water quality is much poorer in the Price River than in waters such as Range Creek. This is due to the rock formations that the Price River flows through. The water quality shows a downstream increase in TDS. The gauge at Woodside shows a TDS range of about 2,500 mg/l to 4,500 mg/l.

The Green River, for the past 82 years, has had an average annual flow of 4,538,000 ac-ft, as measured at Green River, Utah. The water quality is approximately between the values for Range Creek and the Price River. TDS values range from about 300 mg/l to 800 mg/l.

Water use associated with the various levels of tar sand development would change water flows and quality as shown in Table 3-4. These changes were determined from a recent study by the BLM: Utah Special Tar Sands Areas, Their Water Requirements and Future Effect on the Colorado River System (Konwinski 1983).

The model results predict that salinity either would increase or decrease in the Green River by about 1 mg/l. The potential for salinity to increase or decrease would depend upon total water use in the Green River System and simulated flows for future years. For additional details, refer to the above cited report.

Although the Price River was not modeled in the above study, little or no change in salinity would be expected, because water quality is already poor in the areas of withdrawal. The withdrawal areas lie on marine shales that are very high in salts. Due to this, there could be a slight increase in salinity at downstream locations on the Price River and in the Green River where the Price River empties into it; however, these increases would not be measureable.

The net effect of water use on the Colorado River System as measured at Imperial Dam is predicted to be less than 1 mg/l increase in salinity during periods of normal precipitation and no increase during periods of high precipitation.

TABLE 3-4
CHANGES IN WATER FLOW AND QUALITY
(Proposed Actions)

	Range Creek		Price River		Green River	
Parameter	**Collective**	**Cumulative**	**Collective**	**Cumulative**	**Collective**	**Cumulative**
Annual Water Use[a] (ac-ft)	5,000	5,000	16,500	21,000	14,345	14,345
Percent Reduction in Flow	100	100	22	28	<1	<1
TDS Change	large increase	large increase	little or no change	little or no change	±1 mg/l	±1 mg/l

Note: ac-ft = acre-feet; < = less than; TSD = total dissolved solids; ± = plus or minus; mg/l = milligrams per liter; ac-ft/yr = acre-feet per year.

[a]Total water use as measured at Green River, Utah, would be 40,345 ac-ft/yr.

3.A.2 SOCIOECONOMICS

The analysis presented here is based on the **Socioeconomic Technical Report: Sunnyside Special Tar Sand Area Development Analysis** (Argonne National Laboratory 1983). However, two adjustments were made to the analysis in the technical report. One results from changes in the plans of one of the applicants (Chevron-GNC) that occurred too late to be incorporated in the technical report analysis. The other is an estimate of impacts in the peak construction year of 1989. Methods used to make these adjustments are described in Appendix A-6, Socioeconomics.

The area of influence for Socioeconomics consists of Carbon and Emery counties in Utah (refer to Appendix A-6).

Detailed data on historical and current socioeconomic conditions in the area of influence, assumptions for the baseline projections and the interrelated projects, and analytical methodology are given in the technical report. Descriptions of the area of influence and work force assumptions for the interrelated projects are given in Appendix A-6. Socioeconomic mitigation is discussed in the Unresolved Issues section of the Summary and Appendix A-4, Uncommitted Mitigation Measures.

Changes in the plans of individual coal operations in the socioeconomic area of influence have resulted in revised estimates for several of the coal mines that are included as interrelated projects. The need for this change shortly before publication of the draft EIS precluded detailed analysis of the change. However, the difference in direct employment that results from the change amounts to a decrease of about 8 percent in the total direct employment projected for the interrelated projects. It decreases the population attributable to the interrelated projects by about 1,750 in the total area of influence by the the year 2005. This is also a decrease of 8 percent over the 21,330 projected in the draft EIS (Table 3-5). Therefore, the revision causes a significant change in the results of this analysis.

Impact Significance Criteria

Population

The counties and communities selected for inclusion in this EIS are those where significant population growth is projected as the result of the applicants' proposed tar sand developments. Significant growth is defined to be a 5 percent population increase over the baseline. The counties and communities of interest were chosen based on the Utah Process Economic and Demographic (UPED) Model population estimates.

Employment and Income

Increases in per capita personal income (PCPI) for the area of influence of 5 percent or more over the baseline were considered significant.

TABLE 3-5
POPULATION IMPACTS
(Proposed Actions)

	1980	1989	2005	1980	1989	2005
		Total Area of Influence			**Carbon County**	
Baseline Population	33,630	48,190	51,830	22,179	33,520	37,280
Applicants' Collective Impacts[a]		15,850	23,710		13,950	21,740
Percent Increase Over Baseline		33	46		42	58
Interrelated Projects		16,010	21,330		13,750	17,920
Cumulative Impacts		31,860	45,040		27,700	39,660
Percent Increase Over Baseline		66	87		83	106
Total Population	33,630	80,050	96,870	22,179	61,220	76,940
		East Carbon			**Sunnyside**	
Baseline Population	1,942	1,280	995	611	400	315
Applicants' Collective Impacts[a]		2,950	4,860		1,030	1,710
Percent Increase Over Baseline		230	488		258	543
Interrelated Projects		1,250	1,530		430	540
Cumulative Impacts		4,200	6,390		1,460	2,250
Percent Increase Over Baseline		328	642		365	714
Total Population	1,942	5,480	7,385	611	1,860	2,565
		Helper			**Unincorporated Areas of Helper CCD**	
Baseline Population	2,724	3,820	4,100	1,729	2,450	2,660
Applicants' Collective Impacts[a]		670	700		440	460
Percent Increase Over Baseline		18	17		18	17
Interrelated Projects		910	1,020		610	680
Cumulative Impacts		1,580	1,720		1,050	1,140
Percent Increase Over Baseline		41	42		43	43
Total Population	2,724	5,400	5,820	1,729	3,500	3,800
		Price			**Wellington**	
Baseline Population	9,086	15,700	18,500	1,406	2,510	2,800
Applicants' Collective Impacts[a]		5,760	9,100		1,600	2,520
Percent Increase Over Baseline		37	49		64	90
Interrelated Projects		6,850	9,200		1,900	2,550
Cumulative Impacts		12,610	18,300		3,500	5,070
Percent Increase Over Baseline		80	99		139	181
Total Population	9,086	28,310	36,800	1,406	6,010	7,870
		Unincorporated Areas of Price CCD			**Emery County**	
Baseline Population	4,327	6,960	7,500	11,451	14,670	14,550
Applicants' Collective Impacts[a]		1,510	2,380		1,900	1,970
Percent Increase Over Baseline		22	32		13	14
Interrelated Projects		1,790	2,410		2,260	3,410
Cumulative Impacts		3,300	4,790		4,160	5,380
Percent Increase Over Baseline		47	64		28	37
Total Population	4,327	10,260	12,290	11,451	18,830	19,930

TABLE 3-5 (Concluded)
POPULATION IMPACTS
(Proposed Actions)

	1980	1989	2005	1980	1989	2005
		Castle Dale			Cleveland	
Baseline Population	1,910	2,850	2,850	522	600	600
Applicants' Collective Impacts[a]		460	540		80	90
Percent Increase Over Baseline		16	19		13	15
Interrelated Projects		540	840		100	140
Cumulative Impacts		1,000	1,380		180	230
Percent Increase Over Baseline		35	48		30	38
Total Population	1,910	3,850	4,230	522	780	830
		Elmo			Huntington	
Baseline Population	300	370	360	2,316	2,970	2,850
Applicants' Collective Impacts[a]		50	60		330	390
Percent Increase Over Baseline		14	17		11	14
Interrelated Projects		60	100		380	600
Cumulative Impacts		110	160		710	990
Percent Increase Over Baseline		30	44		24	35
Total Population	300	480	520	2,316	3,680	3,840
		Orangeville			Unincorporated Areas of Castle Dale-Huntington CCD	
Baseline Population	1,309	1,970	1,970	1,489	1,570	1,570
Applicants' Collective Impacts[a]		330	390		60	80
Percent Increase Over Baseline		17	20		4	5
Interrelated Projects		380	600		80	120
Cumulative Impacts		710	990		140	200
Percent Increase Over Baseline		36	50		9	13
Total Population	1,309	2,680	2,960	1,489	1,710	1,770
		Green River			Unincorporated Areas of Green River CCD	
Baseline Population	956	960	1,000	166	160	170
Applicants' Collective Impacts[a]		490	330		80	20
Percent Increase Over Baseline		51	33		50	12
Interrelated Projects		80	90		20	10
Cumulative Impacts		570	420		100	30
Percent Increase Over Baseline		59	42		62	18
Total Population	956	1,530	1,420	166	260	200

Note: CCD = Census County Division.

[a]Includes Chevron's interrelated project.

Public Services and Facilities, Human Services and Facilities, and Public Finance

As a general guideline, the impact on public and human services was considered significant if the increased needs in the peak construction year were 10 percent greater than needs in that year for the baseline.

Additionally, any impact was considered significant which exceeded the fiscal capacity of the affected taxing jurisdiction to provide services and facilities from normal revenue sources by 5 percent or more.

Population and Employment

The area of influence consists of two counties in east-central Utah—Carbon and Emery. Much of east-central Utah is sparsely populated. There were only 5.7 people per square mile in the two-county area in 1980, ranging from 2.6 per square mile in Emery County to 15.0 per square mile in Carbon County. In the state as a whole, there were 17.8 people per square mile in 1980, while the figure for the U.S. was 64.0. Price (Carbon County) was the only community in the area with a population greater than 4,000 in 1980. No town had a population of 10,000 people.

Traditionally, most of the east-central region has been dependent on agriculture or energy development. As of 1980, mining was the principal employer in Carbon and Emery counties. The region is well acquainted with the cyclical nature of industrial, especially energy-related, growth. The coal industry in Carbon and Emery counties has experienced frequent boom and bust periods. Of the 6,040 workers in Carbon County in 1981, 52 percent were in mining, contract construction, or manufacturing. Of the 3,695 workers in Emery County in 1981, 2,098 were in mining, between 500 and 1,000 were in contract construction, and between 20 and 100 were in manufacturing.

Carbon County would experience a significant increase in mining employment due to the development of the interrelated projects. Most of the interrelated projects planned for Carbon County are coal mine developments; either an expansion of existing activities or the opening of new mines. Emery County is scheduled to realize relatively minor employment growth due to the interrelated projects. Mining is the only sector in which substantial growth would occur.

Under the proposed actions, the applicants' collective construction work forces would peak in 1989 at 3,810; the permanent operation work forces would peak in 2003 at 4,910 (Table 1-12, Section 1.H). The applicants' proposed projects would cause a population increase of 23,710 by 2005 (Table 3-5). The cumulative (including interrelated projects) population increase would be 45,040 in 2005. These would be increases of 46 percent and 87 percent, respectively, over the 2005 baseline for the area of influence.

Carbon County would receive the greater population growth. In 2005, the population of Carbon County would increase by 58 percent over baseline as a result of the applicants' projects. This would become an increase of 106 percent when including interrelated projects.

On a community level, Price would experience the greatest population growth. However, the communities of Sunnyside, East Carbon, and Wellington would have the greatest population growth relative to baseline, with increases in 2005 of 543 percent (applicants) and 714 percent (cumulative) in Sunnyside, 488 percent (applicants) and 642 percent (cumulative) in East Carbon, and 90 percent (applicants) and 181 percent (cumulative) in Wellington. Based on the significance criterion of a 5 percent or more increase over the baseline, both counties and all communities in the area of influence would experience significant population impacts. Some unincorporated areas within Carbon County are also expected to receive substantial impacts. Based on impacts from the applicants' projects, the unincorporated portion of the Price Census County Division (CCD) would have an increase over baseline in 2005 of 32 percent; with interrelated projects, the increase over baseline would be 64 percent. Table 3-6 presents employment impacts for the affected counties. Employment statistics are not available for community level analysis. For the area of influence, total employment in 2005 is expected to increase by 43 percent over the baseline as a result of the applicants' proposals and 82 percent including interrelated projects.

Carbon County would have the greater increase in employment. In 2005, Carbon County employment would increase more than 50 percent over the baseline due to the applicants' projects, and would be more than double the baseline with the interrelated projects included. Emery County would experience only a 5 percent employment growth

TABLE 3-6
EMPLOYMENT IMPACTS
(Proposed Actions)

	1980	1989	2005	1980	1989	2005
	Total Area of Influence			Carbon County		
Baseline Employment	14,837	20,360	22,900	9,385	13,690	16,020
Applicants' Collective Impacts[a]		7,990	9,750		7,690	9,390
Percent Increase Over Baseline		39	43		56	59
Interrelated Projects		8,420	9,030		6,990	7,280
Cumulative Impacts		16,410	18,780		14,680	16,670
Percent Increase Over Baseline		81	82		107	104
Total Employment	14,837	36,770	41,680	9,385	28,370	32,690
	Emery County					
Baseline Employment	5,452	6,670	6,880			
Applicants' Collective Impacts[a]		300	360			
Percent Increase Over Baseline		4	5			
Interrelated Projects		1,430	1,750			
Cumulative Impacts		1,730	2,110			
Percent Increase Over Baseline		26	31			
Total Employment	5,452	8,400	8,990			

[a]Includes Chevron's interrelated project.

from the applicants' projects, but its growth would rise to 31 percent with inclusion of the interrelated projects. Therefore, both counties would incur significant impacts.

Personal Income

Carbon County experienced a 42 percent increase in PCPI from 1970 to 1980. In 1979, PCPI peaked at $10,489; this was also the highest PCPI in either county during the 10-year period. Emery County experienced a 40 percent increase in PCPI between 1970 to 1980. The 1980 PCPI figure was lower than the 1979 level by 16 percent. Only once during the 10-year period did PCPI reach $8,000: the 1979 PCPI was $8,078.

Because existing mining activity gives the area of influence a relatively high PCPI, the applicants' proposed tar sand developments would not increase the PCPI level of the area significantly over the level projected for the baseline. However, when the interrelated projects are added, the increase would be significant. In 2005, the effect of the applicants' proposed projects and the interrelated projects would raise the PCPI level to an estimated $13,311, as compared to the baseline projection of $12,602 (both in 1980 dollars). This would be a 6 percent increase.

The majority of personal income increases would occur in Carbon County. In 2005, 91 percent of total personal income increases would be in Carbon County as a result of the applicants' proposed projects. The cumulative impact increase would be slightly different, with 87 percent of the total personal income increase occurring in Carbon County.

The substantial increase in personal income for the area of influence of $1,289 million (1980 dollars) in 2005 would likely have significant effects on the cost of consumer goods and services and on the cost of housing. Significant local price inflation could result from local increased purchasing power. This would have an adverse effect on those people with fixed incomes, like the elderly, and those who do not possess the skills to be employable in the higher income occupations.

Housing

Adequate housing provides a basic foundation for community stability and job satisfaction. The collective impacts of the applicants' proposed tar sand developments would seriously test the ability of the affected communities to provide adequate and affordable housing. Table 3-7 shows the additional household demand that would result from the applicants' proposed projects, the interrelated projects, and the cumulative effects from both. Households, as used here and in the population census, means the person or group of persons who occupy a housing unit, whether related or not. The projected increase in number of households is the measure of future demand for new housing units. The 1980 column shows the total housing supply in that year. For the socioeconomic area of influence, the percentage increases over baseline would be 43 percent in 2005; with interrelated projects, increased housing demand would be 81 percent in 2005. Carbon County would experience the majority of the housing demand increases. Price would experience the greatest absolute housing demand increases of the communities included in the area of influence. Sunnyside, East Carbon, and Wellington, however, would experience the greatest housing demand increases compared to baseline. Using the significance criterion of 5 percent over baseline, all communities would be significantly affected. Increased housing demand would have a beneficial effect on the housing construction and finance industries. Nevertheless, limited housing supply likely would contribute to land speculation and increased housing costs in all of the significantly affected communities, with the possible exceptions of Cleveland, Elmo, and Green River.

Local Government Services and Facilities

These assessments of local government services and facilities are based on estimates derived from the technical report (Argonne National Laboratory 1983). The method used to derive the estimates is described in Appendix A-6, Socioeconomics.

Education

Significant increases in teachers and classrooms over projected baseline would be required in the area of influence as a result of applicants' proposed tar sand developments. Carbon County would be the most severely affected, having a demand for an additional 260 teachers and classrooms by 2005 as a result of the applicants' proposed projects. This represents a 138 percent increase over the number required by baseline growth. With interrelated projects, the increase would be 480 teachers and classrooms, or 254 percent by 2005. Emery County would not be significantly affected by the applicants' proposed projects alone, but would have a significant demand increase of 40 teachers and classrooms (66 percent) by 2005 with addition of the interrelated projects. Such large increases in classrooms would require the expansions of the school systems to at least equal this demand, since the baseline demand would eliminate any existing capacity.

Medical

All medical services and facilities would be severely affected under the proposed actions because no additional capacity would be available to support the increased demand caused by the applicants' proposals and the interrelated projects. Even under the baseline demand, there would be a need for additional physicians, dentists, and hospital beds by 1985. Carbon County would experience the most significant impacts, but Emery County also could be highly affected if its present lack of services continues to exist by that time. Under the proposed actions, the area of influence would have a demand for an additional 16 physicians and 12 dentists (133 percent and 120 percent, respectively, over baseline demand) by 2005 as a result of the applicants' proposed projects. Additional hospital beds also would be required, with a 95 percent increase in the socioeconomic area of influence by 2005. Addition of the interrelated projects would raise these needs to 31 physicians (258 percent increase), 23 dentists (230 percent increase), and 150 hospital beds (176 percent increase) by 2005.

Social and Mental Health Services

Understaffing and rising case loads presently affect the social and mental health services in the area of influence. It is estimated that an additional psychologist and 10 more social workers would be required as a result of baseline growth in the next years (Walker 1983). Increased population caused by the applicants' proposed projects and the interrelated projects would create a further need for 2 psychologists and 30 social workers by 2005.

TABLE 3-7
HOUSEHOLDS PROJECTIONS
(Proposed Actions)

	1980[a]	1989	2005	1980	1989	2005
		Total Area of Influence			**Carbon County**	
Baseline Households	11,454	14,590	15,670	7,794	10,570	11,700
Applicants' Collective Impacts[b]		5,750	6,710		5,060	6,140
Percent Increase Over Baseline		39	43		48	52
Interrelated Projects		5,310	5,930		4,560	4,980
Cumulative Impacts		11,060	12,640		9,620	11,120
Percent Increase Over Baseline		76	81		91	95
Total Households	11,454	25,650	28,310	7,794	20,190	22,820
		East Carbon			**Sunnyside**	
Baseline Households	714	400	310	206	130	100
Applicants' Collective Impacts[b]		1,070	1,370		370	480
Percent Increase Over Baseline		268	442		285	480
Interrelated Projects		410	420		140	150
Cumulative Impacts		1,480	1,790		510	630
Percent Increase Over Baseline		370	577		392	630
Total Households	714	1,880	2,100	206	640	730
		Helper			**Unincorporated Areas of Helper CCD**	
Baseline Households	1,074	1,200	1,280	659	790	840
Applicants' Collective Impacts[b]		240	200		160	130
Percent Increase Over Baseline		20	16		20	15
Interrelated Projects		300	280		200	190
Cumulative Impacts		540	480		360	320
Percent Increase Over Baseline		45	38		46	38
Total Households	1,074	1,740	1,760	659	1,150	1,160
		Price			**Wellington**	
Baseline Households	3,195	4,950	5,790	433	790	900
Applicants' Collective Impacts[b]		2,090	2,570		580	710
Percent Increase Over Baseline		42	44		73	79
Interrelated Projects		2,270	2,560		630	710
Cumulative Impacts		4,360	5,130		1,210	1,420
Percent Increase Over Baseline		88	89		153	158
Total Households	3,195	9,310	10,920	433	2,000	2,320
		Unincorporated Areas of Price CCD			**Emery County**	
Baseline Households	1,365	2,190	2,350	3,660	4,020	3,970
Applicants' Collective Impacts[b]		550	670		690	570
Percent Increase Over Baseline		25	29		17	14
Interrelated Projects		600	660		750	950
Cumulative Impacts		1,150	1,330		1,440	1,520
Percent Increase Over Baseline		53	57		36	38
Total Households	1,365	3,340	3,680	3,660	5,460	5,490

TABLE 3-7 (Concluded)
HOUSEHOLDS PROJECTIONS
(Proposed Actions)

	1980[a]	1989	2005	1980	1989	2005
		Castle Dale			**Cleveland**	
Baseline Households	622	780	780	156	170	160
Applicants' Collective Impacts[b]		170	150		30	30
Percent Increase Over Baseline		22	19		18	19
Interrelated Projects		180	230		30	40
Cumulative Impacts		350	380		60	70
Percent Increase Over Baseline		45	49		35	44
Total Households	622	1,130	1,160	156	230	230
		Elmo			**Huntington**	
Baseline Households	90	100	100	757	810	780
Applicants' Collective Impacts[b]		20	20		120	110
Percent Increase Over Baseline		20	20		15	14
Interrelated Projects		20	30		130	160
Cumulative Impacts		40	50		250	270
Percent Increase Over Baseline		40	50		31	35
Total Households	90	140	150	757	1,060	1,050
		Orangeville			**Unincorporated Areas of Castle Dale-Huntington CCD**	
Baseline Households	397	540	530	414	440	430
Applicants' Collective Impacts[b]		120	110		20	20
Percent Increase Over Baseline		22	21		5	5
Interrelated Projects		130	160		30	30
Cumulative Impacts		250	270		50	50
Percent Increase Over Baseline		46	51		11	12
Total Households	397	790	800	414	490	480
		Green River			**Unincorporated Areas of Green River CCD**	
Baseline Households	388	260	270	37	40	50
Applicants' Collective Impacts[b]		180	90		30	20
Percent Increase Over Baseline		69	33		75	40
Interrelated Projects		30	20		5	5
Cumulative Impacts		210	110		35	25
Percent Increase Over Baseline		81	41		88	50
Total Households	388	470	380	37	75	75

Note: CCD = Census County Divison.
[a]Total available stock of year-round housing units.
[b]Includes Chevron's interrelated project.

Law Enforcement

Significant increases over baseline in demand for law officers and patrol cars would occur in the area of influence under the proposed actions. By 2005, Carbon County would have an increase in demand over baseline of 148 percent for law officers and patrol cars as a result of the applicants' proposed projects, and 268 percent with addition of the interrelated projects. Emery County's demands, while large percentagewise, would be small in number. Jail facilities also would have to be expanded, particularly in Carbon County where the facility is presently overcrowded.

Fire Protection

Additional fire equipment would likely be required in the area of influence, but available data does not allow numerical estimates. It is also likely that at least some of the communities would no longer be able to rely on volunteer fire departments.

Sewer

Sewage system capacity figures are not available for several of the communities. Of those that are available, the systems in Cleveland and Elmo would be adequate for the cumulative population growth projected under the proposed actions. However, the systems in both East Carbon (including Sunnyside) and Huntington would be overloaded by the construction peak in 1989, and the combined system of Castle Dale and Orangeville would exceed capacity by 2000. The combined system of Price, Helper, and Wellington is currently over design capacity. A planned expansion of the system to a capacity sufficient for a 31,500 population would still fall short of the needs in the peak construction year of 1989, when a combined population of 39,700 is projected for the three towns.

Water

Increased demands for water in the area of influence resulting from the applicants' proposed actions would be significantly over the increases required under the baseline in both Carbon and Emery counties. Water demand in Carbon County, as measured by number of water system connections, would increase 144 percent over baseline by 2005 from the applicants' proposed projects and 263 percent with the addition of the interrelated projects. In Emery County, the comparable increases would be 64 percent and 174 percent.

The available information indicates the community water systems have little or no excess capacity in terms of number of connections. In Carbon County, the Price water treatment plant's design capacity is considered well under peak demand, while the system serving East Carbon and Sunnyside obtains its water from the Grassy Trail Creek watershed which would be affected by tar sand mining activity. Scofield Reservoir, the sole source of water for Wellington and the unincorporated area surrounding Price and Wellington, is currently being used at 50 to 60 percent of its capacity. In Emery County, the system that serves Cleveland, Elmo, Green River, Huntington, and Orangeville cannot accommodate any new connections. The Castle Dale system's maximum number of connections would be exceeded in the peak construction year of 1989.

Local Government Finance

The local government jurisdictions in the area of influence vary widely in their ability to absorb financial impacts. The following analysis focuses on their general obligation indebtedness, because it is what would determine their capacity to provide the infrastructure improvements required by future growth.

Carbon County had no outstanding general obligation bonds in 1981. East Carbon, Helper, and Price had indebtedness in 1982 ranging from $200,000 to $800,000. Wellington had $6,000 in outstanding general obligation bonds in 1981; and until the 1982 water bond issues, Sunnyside had no indebtedness.

The Price Water Improvement District is the other major taxing jurisdiction in the county. The district provides utility services for many residents within the county and many assume responsibility for all water and sewer service in the county. The district has incurred three forms on long-term debt: general obligation bonds, revenue bonds, and notes payable. General obligation bonds amount to nearly $3.2 million outstanding or 40 percent of the bond capacity of the district. Nearly $900,000 in revenue bonds are outstanding, as are $450,000 of notes payable. Total long-term debt exceeds $4.5 million.

In 1981, Emery County had $2,363,587 in outstanding general obligation bonds. Based on the high assessed valuation of the county, it has the capacity to enter into at least an additional $21 million of indebtedness. Between 1980 and 1982, the cities in the county had outstanding debts ranging from $116,000 in Ferron to $1.1 million in Huntington. Cleveland did not have any outstanding debts.

Emery County School District ranks as the fifth wealthiest in Utah in terms of assessed valuation per student ($66,427 in 1981 to 1982) and there has been steady growth in the valuation available to support school expenditures.

In addition to the county, community, and school districts, the Castle Valley Special Service District (CVSSD) is a major taxing jurisdiction in the county. The CVSSD has incorporated the water, sewer, drainage, and road needs of Castle Valley communities (Cleveland, Elmo, Huntington, Castle Dale, Orangeville, Ferron, and Emery) into a taxing district that includes both the communities and the power plants. This gives the district substantial financial power; since 1977, it has bonded for $20 million to support a variety of improvements.

Because demands on local infrastructure from baseline growth would equal or exceed their present capacity in many cases, the additional demands that would be imposed by the applicants' developments and the interrelated projects would require significant increases in capacity, particularly in Carbon County. Expansions would be needed in school classrooms, medical facilities, jails, and many of the water and sewer systems; and probably in other facilities that are not included in this analysis. A majority of the additional capacity would be needed to meet the demands of the construction period, but the largest part of the increased revenues from the developments would become available only after the builders of mining operations. Also, those newcomers would accrue largely to the counties, since the mines would be located in unincorporated areas, whereas much of the infrastructure costs would be born by the communities.

Operating expenditures would be increased by needs for additional administrative and professional staff, greater demands on public safety and social welfare services, and the operation and maintenance costs of the expanded infrastructure.

Additional fiscal information is provided in the socioeconomic technical report.

It is expected that severe fiscal pressure would result from the proposed actions unless mitigated by the impacting companies with some federal and state assistance. The rapid growth in population would cause immediate service demand increases. Revenues would lag initially Senate Bill 170 and coordinated mitigation planning, such as that required by Utah and Carbon County Conditional Use Permit, would be necessary to avoid severe short-term service inadequacies.

The long-term fiscal effects could be both beneficial and adverse. Large scale investments associated with the proposed projects would result in substantial increases in the tax base, especially for the affected counties and districts. However, there could be long-term adverse effects from facilities becoming under-utilized tax burdens after the population declines from peak levels.

Other Affected Industries

Hunting, Fishing, and Nonconsumptive Wildlife Use Expenditures

Hunting, fishing, and nonconsumptive use of wildlife (bird-watching, photography, etc.) bring income to the local economy in the form of local expenditures by outsiders. These purchases are made for lodging, food, gasoline, and sporting goods. Historic expenditures and numbers of participants (1978 to 1982) for Carbon County are shown in Table 3-8.

The monetary value of the wildlife resources to the Carbon County area is considerable and is in addition to the license monies that support the wildlife management programs of the State of Utah. Hunting success rates and the number of days spent hunting and fishing, and nonconsumptive uses of wildlife in Carbon County are discussed in Section 3.A.5, Recreation Resources.

Numbers of mule deer utilizing ranges in the STSA have not completely recovered from the severe declines during the late 1960's. In spite of the present low population level, the mule deer is a very important trophy and game species in this area. In addition to its trophy value, the mule deer is of significant importance to Carbon County because of the number of hunters who come to the area to hunt.

TABLE 3-8
SUMMARY OF HUNTING STATISTICS (1978 TO 1982) IN THE AFFECTED AREA[1]

Item	Total Participants	Number of Animals Harvested	5-Year Total Expenditures
Big Game[2]			
Mule Deer	10,286	3,006	$2,915,777
Black Bear[3]	14	5	5,354
Mountain Lion[3]	24	18	48,671
Upland Game[4]	27,025	131,019	3,110,003
Waterfowl[5]	1,196	9,199	165,008
Waterfowl[6]	780	3,817	85,607

[1]The data for this table were derived from various reports developed by the Utah Division of Wildlife Resources for the 1978-1982 period (UDWR 1978-1982).

[2]No open seasons on elk or bighorn sheep in this area.

[3]Based on very small sample sizes.

[4]Includes 9 species of upland game.

[5]Includes both duck and goose hunters.

[6]Includes **only** data from the Desert Lake Waterfowl Management Area in Emery County for duck and goose hunters.

In addition to the food value of harvested animals (about 300,600 pounds of meat during the 1978 to 1982 period), deer hunters spent an estimated $2,915,777 in Carbon County, during the 5-year period, in pursuit of mule deer (Table 3-8). This was a considerable boost to the local economy.

Black bear and cougar are found in considerable numbers in the STSA (approximately 1/4 of the state cougar harvest occurs in deer herd unit 27B, (UDWR 1983) and both of these species furnish considerable hunting and economic return. During the 1978 to 1982 period, estimated expenditures by bear hunters totaled about $5,354, while cougar hunters spent about $48,671 during the same period.

Small game hunters (9 species) spent an estimated $3,110,003 during the same period, while waterfowl hunters spent about $250,615.

In 1980, an estimated 22,179 persons lived in Carbon County. If data presented in Allred (1976) remains valid, approximately 30 percent of these persons were involved in nonconsumptive uses of the wildlife resources of the county. It is also estimated that nonconsumptive users spend about $87.40 each in pursuit of birdwatching and general wildlife observation trips, therefore, spending a minimum of $581,560 (1980 dollars) in the county in 1980. The total estimated expenditures for the 5-year period, 1978 to 1982, for nonconsumptive uses of wildlife was $2,908,205 by 33,624 persons.

The total estimated minimum value of consumptive and nonconsumptive uses of the wildlife resource in Carbon County in 1980 dollars is at least $6,330,420 for the 1978 to 1982 period.

Based on data supplied by the Utah Division of Wildlife Resources, the estimated increases in expenditures from hunting in 1985 (over 1980) would be $1,682 (1980 dollars) under the collective analysis as a result of the population increases that would result from implementation of the applicants' proposed projects. In 1995, the collective estimated increase would be $373,917. For nonconsumptive uses of wildlife, under the collective scenario, the estimated expenditure increase would be $1,835 in 1985 as a result of the applicants' projects; in 1995 the value would be $399,855. Under the cumulative scenario, 1985 hunting expenditures would increase $108,852, while the 1995 increase would be $742,194. Nonconsumptive uses in 1985 would increase $116,470 and in 1995, $793,679.

Although expenditures would increase, the overall usage of wildlife and the removal or change in habitats could reduce the wildlife population to the extent that the number of persons involved in consumptive and nonconsumptive uses of wildlife would be reduced. This could, in turn, reduce potential economic benefits from wildlife in the long-term. (Refer to Section 3.A.4, Wildlife, for a more detailed discussion of the anticipated impacts to wildlife from the Sunnyside project.)

Quality of Life

A development of this size in a fairly sparsely populated area would cause both beneficial and adverse impacts. The adverse impacts would occur first, in the form of service shortfalls, local government fiscal problems, housing shortages and inflation, and strains on social organizations and individuals. Later, when these problems had been overcome, the area would benefit from a larger employment and tax base and a stronger infrastructure.

The local social changes associated with the projected population growth could be very significant. However, their impact would be modified by the fact that practically all of the communities in the area of influence have recently experienced boom conditions and are familiar with the types of problems that accompany them. Nevertheless, the magnitude of the projected growth likely would cause serious adjustment difficulties in several of the communities, especially East Carbon, Sunnyside, and Wellington.

Price, the largest community in the area, has already undergone many of the changes described below. Therefore, the following paragraphs apply mainly to the smaller communities.

Population growth could lead to more local governmental formality and regulation. Local governments could require more outside professional help in dealing with growth-related problems. Coordination between authorities at the state, county, and municipal levels would be required, along with the cooperation of private sector industrial firms.

The affected communities could become more segmented and diversified. Length of residence, occupation, religious preference, and similar characteristics could become even more influential factors in defining relations among residents.

Retail expansion could enhance employment opportunities for young people and others who may have limited work experience. However, this economic activity also could lead to numbers of young people leaving high school to enter the job market. Overall, the additional mining and construction jobs would eliminate present unemployment problems and enable residents, especially young people, to find work in the area rather than being forced to move elsewhere for employment.

Increased employment and population resulting from tar sand development would add to the volume of local business, but would also bring in additional competition.

The smaller communities, in particular, would change toward more urban atmospheres. Impersonalization of community life would become more evident. Residents, especially women and the elderly, would have less feelings of security as large numbers of new people entered the area.

Stress attached to residence in a rapid-growth area would occur. It likely would be more evident among newcomers, particularly women. The increased level of stress and uncertainty could be reflected in higher levels of reported crime, at rates in excess of population growth. Family instabilities (conflicts, child abuse, divorce, etc.) could increase, particularly in more crowded residential environments. Shortfalls in available housing would intensify these problems.

Availability of other community services and facilities also could be a problem. Quality of education could suffer if physical plants, personnel, and maintenance funds are not available in a timely manner. Health care is typically a problem in such settings as well. Deficits in facilities, personnel, and particularly emergency care treatment could cause genuine hardships. Mental health services, already pressured in the area of influence, could be critical in reducing some of the adaptive problems encountered by individuals. Timely availability of all these services certainly would reduce the instabilities often associated with rapid growth.

In general, these effects would be most immediate and intense for newcomers, who would lack resources to deal with them. However, as construction nears completion and the proposed facilities become operational, the local social environment would become more stable and predictable.

Local residents' attitudes toward the proposed developments would probably be keyed to the degree of permanence they would be offered. The areas' history mining booms and busts, and the

current unemployment problem, have created a high level of concern about economic stability. Announced plans might be greeted with skepticism until it became certain that the developments would occur and would be relatively long-lasting.

3.A.3 SOILS AND VEGETATION

Impact Significance Criteria

In order to determine the significance of the predicted impacts, impact significance criteria were developed. These criteria are based on (1) professional experience concerning the effectiveness of erosion control, reclamation, soil reconstruction, and revegetation measures as associated with similar kinds of projects; and (2) a body of research as referenced in the Erosion Control, Reclamation and Revegetation Program Checklist developed by the BLM, Division of EIS Services (Appendix A-7, Reclamation and Erosion Control Programs).

Impacts to soils are considered significant if the loss of soil and reduction in soil productivity and stability due to land disturbance would prevent successful restoration and recovery to near preconstruction conditions.

Impacts to vegetation are considered significant if (1) following construction, more than 5 years would be required to reestablish a ground cover; (2) poisonous and noxious weeds would invade and occupy more than 5 percent of a specific vegetation type where none existed previously; or (3) the diversity of preconstruction vegetation types could not be restored due to topographic or microclimatic changes.

Setting

The main block of the Sunnyside STSA, where the majority of the impacts would occur, consists of moderately steep sloping to very steep mountains with narrow crests and valleys, including some gently sloping to strongly sloping plateaus, mesas, and convex ridges. The area is dissected by a dendritic drainage pattern of intermittent and perennial streams that drain to the southwest, south, southeast, and northwest. The area to the southwest of the main block of the STSA, where some of the proposed processing plants and spent sand disposal piles would be located, consists of gently sloping to strongly sloping alluvial fans, piedmont plains, and piedmont slopes from the surrounding mountains that have formed a broad intermountain basin. Intermittent drainages with very narrow floodplains are common, draining to the south and southeast. Figure 3-1 illustrates the complex topography that exists in the affected area.

Elevations range from 5,630 feet at Sunnyside Junction to 10,285 feet at Bruin Point. Average annual precipitation ranges from 8 to 30 inches (Map 3-2, map pocket). In the lower elevations, this precipitation occurs as rain during the spring and fall. At the higher elevations, the precipitation is evenly distributed throughout the year, with much of it occurring as snow during the winter. The average frost-free period is 60 to 120 days, including some areas at elevations greater than 8,200 feet with less than 60 days and areas in Climatic Zones A and B near Sunnyside Junction with 110 to 165 days.

Soils

Based on the impact analysis and the soils impact significance criteria, it is predicted that even though impacts would occur to soils, through the use of the applicants' proposed reclamation procedures and the measures that would be required by BLM (Appendix A-7, Reclamation and Erosion Control Programs), there would be no significant impact on soils. However, some localized, very steep areas (about 5 to 8 percent of the area) resembling talus-like slopes with very low productive capacity could remain in the reclaimed landscape. These areas would equate to the preconstruction occurrence of rock outcrop canyon walls, escarpments, and exposures) in extent and productivity. The mining disturbance and complete alteration of the existing soil profiles and landscape would cause short-term losses of soil productivity and an increase in soil loss due to erosion by wind and water during the period from initial disturbance until reclamation and initial establishment of understory plants. The types of land disturbance that would occur are discussed in this section, as they would affect soils and significantly affect other resources such as vegetation, water, and wildlife.

A third-order soil survey (SCS and BLM 1981) covers the entire Sunnyside STSA. Soil information from this soil survey was used to evaluate potential impacts and would be used by the applicants and

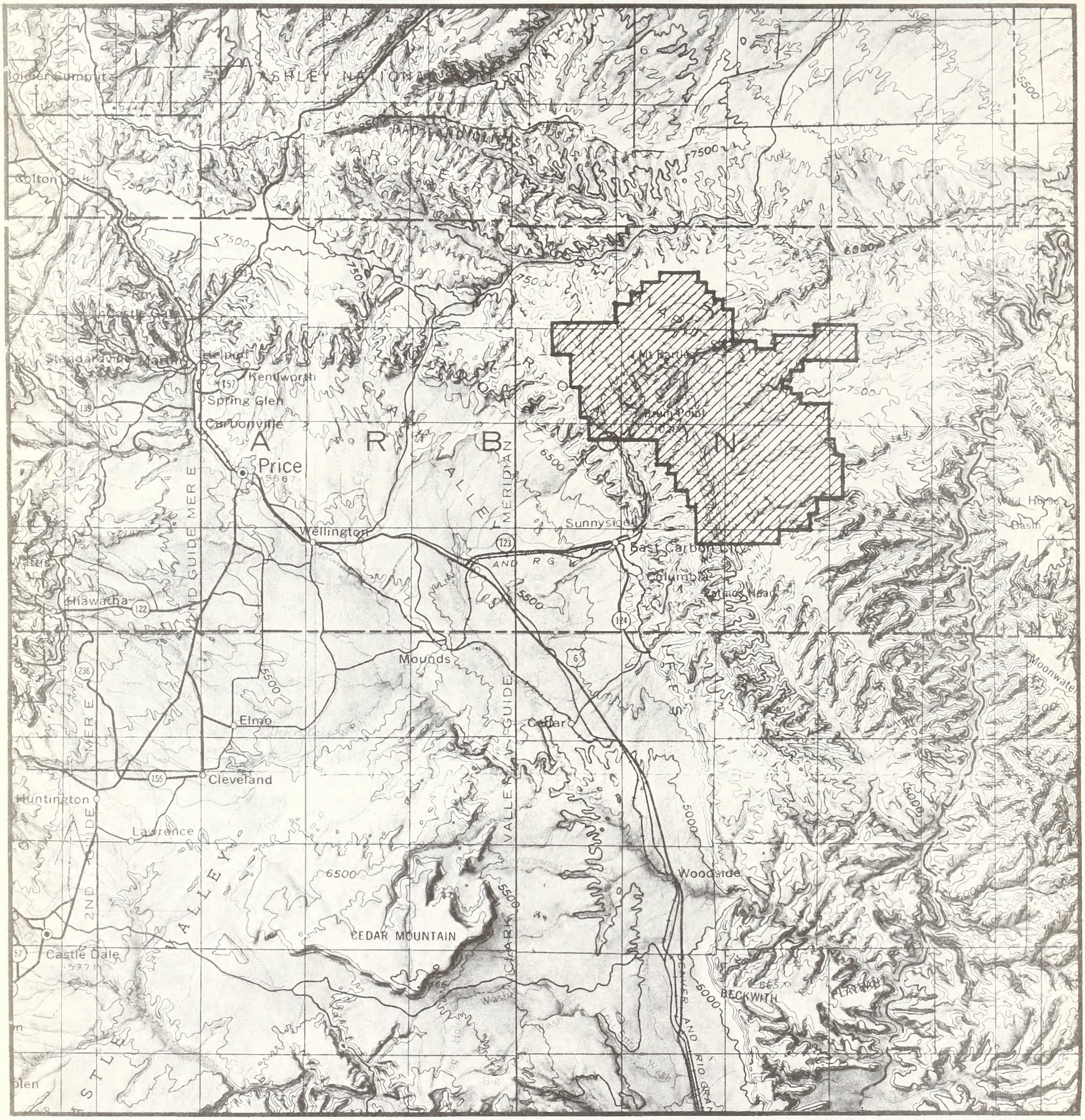


FIGURE 3-1 TOPOGRAPHY OF SUNNYSIDE AREA

authorizing agencies to determine applicable erosion control, reclamation, and revegetation measures. The area of influence includes a wide variety and complex combinations of soils due to variations in parent material (geologic), climatic, topographic, and vegetative features. The soil map units from the third-order soil survey were combined into 4 generalized groups for the purpose of impact analysis, and for determining effective erosion control measures, and reclamation and revegetation potential of the area. Soil groups were further divided, according to their location in different climatic zones.

The generalized groups are (1) soils of the floodplains and terraces (A); (2) soils of the sloping to strongly sloping alluvial fans and high terraces of the plains (F); (3) soils of the sloping to strongly sloping mesas, mountain ridge tops, plateaus, and strongly sloping to moderately steep mountain side slopes (M); and (4) soils of the steep and very steep mountain sideslopes, canyon walls, and mesa escarpments (MS). Soil groups M and MS were further divided into three climatic zones:

1 - 12 to 16 inches of precipitation and 60 to 120 days growing season
2 - 16 to 20 inches of precipitation and 60 to 120 days growing season
3 - 20 to 30 inches of precipitation and less than a 60 days growing season

A brief description of these soils is located in Appendix A-7, Reclamation and Erosion Control Programs. Additional detail on soil types and the analysis process is available for inspection at the Division of EIS Services.

Table 3-9 presents the collective and cumulative acreages of disturbance by soil groups.

TABLE 3-9
ACRES OF SOIL GROUPS AFFECTED AND DISTURBED
(Proposed Actions)

Project Component	Total Acres Disturbed[a]	A[b]	F	M1	M2	M3	MS1	MS2	MS3	Undetermined[c]
		Acreages of Soil Groups Affected and Disturbed								
Collective Totals										
Conversion Areas Affected[d]	28,800	376	339	626	3,120	1,804	184	11,952	10,399	0
Mine (Surface)	21,093	344	0	42	1,557	1,734	28	7,905	9,483	0
Plant and Spent Sand Disposal	6,407(267)	302	1,044	0	80	151	936	1,854	2,040	0
Plant and In-Situ Mining	6,000	22	274	478	1,294	6	130	3,307	489	0
Ancillary Facilities	2,445(415)	0	0	0	0	0	0	0	0	2,445
Total	35,945	668	1,318	520	2,931	1,891	1,094	13,066	12,012	2,445
Interrelated Projects Totals										
Mine (Surface)	1,400	0	0	0	0	118	0	1,223	59	0
Mine (In-Situ)	0	0	0	0	0	0	0	0	0	0
Plant and Spent Sand Disposal	1,200(200)	0	1,200	12	0	0	0	0	0	0
Ancillary Facilities	300	0	0	0	0	0	0	0	0	300
Total	2,900	0	1,200	12	0	118	0	1,223	59	300
Cumulative Total										
Conversion Areas Affected[d]	28,800	376	339	626	3,120	1,804	184	11,952	10,399	0
Mine (Surface)	22,493	344	0	42	1,557	1,852	28	9,128	9,542	0
Mine (In-Situ)	6,000	22	274	478	1,294	6	130	3,307	489	0
Plant & Spent Sand Disposal	7,607	302	2,244	0	80	151	936	1,854	2,040	0
Ancillary Facilities	2,745(415)	0	0	0	0	0	0	0	0	2,745
Total	38,845	668	2,518	520	2,931	2,009	1,094	14,289	12,071	2,745

Note: Figures enclosed by parentheses are acreages removed (plant sites and roads) for life of projects. Land disturbance acreages also include areas disturbed outside the STSA, consisting mainly of plant sites and spent sand disposal areas.

[a]Total acres disturbed refers to total area that would be disturbed for life of projects.

[b]Includes measured, delineated areas of flood plain soils; additional small areas not mappable due to map scale occur throughout the area of influence.

[c]Acreages not determined because specific locations of facilities are unknown at this time.

[d]Total lease area to be converted.

Land disturbance associated with the proposed conversion of the leases and subsequent development of the tar sand resource collectively would affect approximately 35,945 acres (Table 1-9 located in Chapter 1). Land disturbance associated with the interrelated projects plus the conversion-related tar sand development cumulatively would affect 38,845 acres within the area of influence. The land disturbance would result from the following types of activities (listed in descending order of magnitude):

1. Surface mining
2. In-situ recovery
3. Spent sand disposal
4. Ancillary facilities (pipelines, roads, power lines)
5. Plant site facilities

Surface mining and in-situ recovery activities would disturb an estimated 27,093 acres of the 28,800 acres of proposed conversion areas. During steady-state operations, approximately 6,500 acres would be disturbed and unreclaimed at any one time within the proposed conversion areas. Cumulative areas disturbed at one time would be the same as collective, except that the number of disturbed acres would increase a little faster and peak out at 7,050 for 2 to 3 years then return to 6,500 for the remainder of the project life.

Surface Mining

Surface mining activities collectively could disturb a total of 21,093 acres of land and cumulatively disturb 22,493 acres of land. Surface mining disturbance would involve removing favorable plant growth materials and overburden materials, stockpiling these materials, removing the tar sand, replacing the overburden, disposing of toxic materials (if present), and regrading the surface.

Due to the steep and very steep topography, surface mining would be difficult and require intensive surface mining procedures to minimize impacts to soils. Specific type and duration of land disturbance would vary depending on the surface mining sequences, which can only be estimated at this time.

Surface mining would cause major topographic surface changes that would be in disequilibrium with surrounding areas not being surface mined or areas where the in-situ process would be used. Surface mining and the removal of the varying thickness of tar sand (ranging from 100 to 500 feet) would reduce the average elevation (even assuming a swell factor of 15 to 20 percent for the expansion of overburden would not compensate for the removal of the tar sand). The reduction of the average elevation would reduce the steepness of slopes in the steep and very steep areas (with the exception of headwall areas), and would alter topography to the extent that surface expressions and aspect would be changed and would have less influence on diversity of vegetative growth. Surface and topographic changes would strongly affect surface water runoff and water infiltration rates (Section 3.A.1, Water Resources).

The impacts on the microclimate are estimated to be localized and quantitatively unknown. It is anticipated that microclimate changes due to alterations in temperature (aspect related), precipitation, and wind patterns would result from changes in elevation, topography, and surface irregularity. (Surface irregularity would result where surface mining, in-situ recovery, and/or no mining would occur in adjacent areas.) Microclimate changes would strongly affect vegetation, as discussed in the last part of this section.

The reclamation program would consist of replacing overburden materials (mainly sedimentary rock) and in some cases spent sand into the pit area or adjacent canyons and covering the overburden with a mantle of soil material (favorable plant growth materials) in a sequential manner to provide for a suitable land surface with favorable internal and surface drainage, and a favorable medium for plant growth. Availability of adequate volumes of suitable plant growth materials to cover the surfaces of the regraded surface mine areas is a concern due to the dominantly shallow and moderatly deep soils in the mountain area. Effective utilization of suitable materials available on convex ridges, concave and cove areas, toe slopes and the suitable finer material created in the overburden removal and placement process would be essential to reconstruct soils to preconstruction productive capacity. Some steep and very steep localized areas (about 5 to 8 percent) resembling talus-like slopes could remain. These areas would equate to the preconstruction occurrence of rock outcrop areas (canyon walls and escarpments) in extent.

To provide for more favorable erosion control and revegetation, the maximum slope of the reclaimed land (with the exception of headwall cuts bordering unmined or in-situ recovery areas) as required by

BLM, would be 30 percent with slope distances no greater than 100 feet (Appendix A-7, Reclamation and Erosion Control Programs).

In-Situ Recovery

In-situ recovery activities would disturb a collective total of 6,000 acres of land (Table 1-10, Section 1.H.1) and 135 acres for associated ancillary facilities. None of the interrelated projects are involved in-situ recovery.

In-situ recovery would be restricted to areas with less than 50 percent slope due to the type of extraction facilities proposed for use. The surface disturbance would consist of vegetation removal and topsoil disturbance in plot-like areas. Accelerated wind and water erosion would occur in these areas during construction and operation (Section 3.A.1, Water Resources). The surface disturbance caused by vegetation removal and the necessary oil recovery facilities and vehicular traffic would remain for approximately 1 to 10 years.

Erosion control, reclamation, and revegetation procedures would be implemented in phases throughout the in-situ process and are expected to be successful (Appendix A-7, Reclamation and Erosion Control Programs).

Spent Sand Disposal

Land disturbance associated with spent sand disposal areas would occur on a total of 7,140 acres, of which 4,140 acres are proposed to be located outside the STSA area, northwest and southwest of Sunnyside (Climatic Zones B and C, Map 3-2, map pocket), and 1,500 acres are proposed to be located northeast of Patmos Head, in the Range Creek area (Climatic Zone D). Approximately 1,500 acres of additional spent sand would be returned to the mined-out areas, but no additional surface disturbance would result from its disposal.

Vegetation cover and topsoil, including other soil material favorable for plant growth, would be removed from the area where the spent sand is to be placed and stockpiled in stages concurrent with project operations. The total area would not be disturbed or covered by spent sand in the early stages of the projects.

The proposed spent sand disposal areas near Sunnyside are located on the gently to strongly sloping alluvial fan area formed by mixed alluvial materials derived from sandstone and shale originating from the bordering mountain area. Soils within this area (Ildefomso very stony loam) are mainly deep, loamy soils containing varying amounts of rock fragments (SCS-BLM 1981). A soil material suitable for reclamation is adequate at these sites with proper excavation and handling.

The disposal areas would be reclaimed in stages concurrent with mining operations throughout the life of the projects. At this time, the physical and chemical properties of the spent sand are not specifically known. Approximations indicate textures that would include sandy loams, fine sandy loams, loamy fine sands, and silts. Salt content is expected to be slight to moderate, with pH ranging from 6.0 to 8.4. The spent sand is also expected to contain some petroleum residues resulting from the extracting process.

The surface of sand disposal areas would be stabilized and made suitable for plant growth through various reclamation measures (Appendix A-7, Reclamation and Erosion Control Programs). These measures would minimize the problems of making the spent sand favorable for revegetation, especially if the sand contains chemical properties that would require very intensive measures to reduce them to tolerable levels. To ensure an effective thickness for plant growth, a mantle of at least 12 to 18 inches of suitable plant growth material would be necessary (Cook 1974). Spent sand disposal areas located within the mountain area would require less side slope area reclamation due to the canyon fill type of disposal.

Ancillary Facilities

Construction of right-of-way facilities temporarily would disturb collectively an estimated 2,445 acres of land for approximately 1 to 2 years. Cumulatively, an estimated 2,745 acres would be disturbed for 1 to 2 years.

Construction and installation of right-of-way facilities would cause topsoil disturbance, soil compaction, and alteration of the soil profile along the excavated trench area of pipelines and along borrow areas of roads. Accelerated wind and water erosion would occur until erosion control measures are implemented (1 year). Also, right-of-way facilities requiring access roads for maintenance would create problems in controlling off-road vehicle traffic and minimizing off-road land disturbance. Soil impacts would generally be considered insignificant because only short-term losses would be expected from this type of land disturbance.

Plant Facilities

Plant site facilities proposed by the applicants collectively would disturb and remove 267 acres of land for the life of the operations (long-term). This land would be reclaimed upon abandonment. Considering interrelated project plant site facilities in addition to the applicants' proposed facilities, about 467 acres within the area of influence would be disturbed cumulatively.

Vegetation

Based on on the impact analysis and the vegetation impact significance criteria, some significant vegetative impacts could occur. The impacts would be directly related to the different types of land disturbance and climatic zones discussed in the previous section on soils. The significance of the impacts and acreage that would be affected would depend on how well the proposed reclamation programs (Appendix A-7) and measures are implemented. The significance and amount of the impacts also would depend on the type of mining procedures actually employed and the amount of acreage actually disturbed. At this time, only worst-case estimates of impacts can be projected.

Significant vegetative impacts could occur in the low precipitation zones (Climatic Zones A, B, and C) (Map 3-2, map pocket). Collectively, the applicants' proposed developments would disturb 1,838 acres in these zones. Considering the interrelated projects in addition to the applicants' developments, 3,038 acres would be disturbed cumulatively. It might not be possible to establish a ground cover within 5 years. Other significant vegetative impacts would relate to the criteria of not being able to restore the pre-project diversity of vegetative types. Within surface mined areas (estimated 11,651 acres of collective applicant disturbance and 12,853 acres of cumulative), changes in topography, slope, and aspect would alter the microclimate, which would cause changes in plant communities. The intricate diversity of plant community occurrence for some plants that require specialized microenvironmental conditions, mainly shrub types and trees, would be strongly affected and possibly precluded from reestablishment on the reclaimed surface mined areas. Aspen and mixed-conifer vegetation types would be most strongly affected by microclimatic changes. These vegetative impacts so would affect wildlife (Section 3.A.4) and grazing (Section 3.A.9).

The vegetation inventory, forage availability, and revegetation potential information presented in this EIS was gathered from vegetation surveys and the third-order soil survey completed during the 1978 and 1979 field season (SCS and BLM 1981). Vegetation and soil mapping was done on a scale of 1:240,000, and these maps are on file at the BLM Price River Resource Area Office. Additional information, including vegetation conditions and vegetation manipulation, was referenced from the **Price River Grazing Management Draft Environmental Impact Statement** (BLM 1982).

Seven major vegetation types would be affected: pinyon-juniper, desert shrub, sagebrush-grass, mountain shrub, aspen, mixed-conifer, and riparian. These types combine several vegetation communities and range sites. They were identified in order to evaluate potential impacts and determine revegetation and regeneration potential.

The estimated total area of each vegetation type that would be disturbed collectively by the applicants' proposed developments and cumulatively by the applicants' plus interrelated projects are shown on Table 3-10. A brief description of the types and their use and importance follows.

Riparian (645 acres disturbed collectively, 645 acres disturbed cumulatively).

The riparian vegetation type includes the succulent and woody vegetation occurring along stream courses. The riparian zone is one of the highest producers of forage per acre and an important wildlife habitat. Riparian vegetation stabilizes stream banks, affects the quality of stream water, and adds to the diversity of an area. Riparian communities are generally comprised of cottonwood trees, aspen, willow, aster, Kentucky bluegrass, western wheatgrass, Woods rose, and a variety of forbs.

It is estimated that 2 to 5 years would be required for grasses in this type to recover from disturbance.

Desert Shrub (0 acres disturbed collectively, 1,000 acres disturbed cumulatively).

The desert shrub type occurs in the basin areas where annual precipitation is less than 10 inches. Major shrub species include shadescale, winterfat, bindsage, rabbitbrush, black sage brush, and big sage brush with a transition to juniper along the eastern edge of this type. Common grasses are

TABLE 3-10
ACRES OF VEGETATION TYPES AFFECTED AND DISTURBED
(Proposed Actions)

Project Component	Total Acres Disturbed[a]	Riparian[b]	Desert Shrub	Pinyon-Juniper	Sagebrush-Grass	Mountain Shrub	Aspen	Mixed Conifer	Undetermined[c]
Collective Totals									
Conversion Areas Affected[d]	28,800	376	0	2,048	4,773	10,594	4,050	6,959	0
Mine (Surface)	21,093	344	0	659	1,982	8,303	3,552	6,253	0
Plant and Spent Sand Disposal	6,407(267)	279	0	2,864	483	935	295	1,551	0
Plant and In-Situ Mining	6,000	22	0	1,149	2,309	1,844	260	416	0
Ancillary Facilities	2,445(415)	0	0	0	0	0	0	0	2,445
Total	35,945	645	0	4,672	4,774	11,082	4,107	8,220	2,445
Interrelated Projects Totals									
Mine (Surface)	1,400	0	0	0	58	140	373	829	0
Plant and Spent Sand Disposal	1,200(200)	0	1,000	200	0	0	0	0	0
Ancillary Facilities	300	0	0	0	0	0	0	0	300
Total	2,900	0	1,000	200	58	140	373	829	300
Cumulative Total									
Conversion Areas Affected[d]	28,800	376	0	2,048	4,773	10,594	4,050	6,919	0
Mine (Surface)	22,493	344	0	659	2,040	8,443	3,925	7,082	0
Mine (In-Situ)	6,000	22	0	1,149	2,309	1,844	260	416	0
Plant and Spent Sand Disposal	7,607(267)	279	1,000	3,064	483	935	295	1,551	0
Ancillary Facilities	2,745(615)	0	0	0	0	0	0	0	2,745
Total	38,845	645	1,000	4,872	4,832	11,222	4,480	9,049	2,745

Note: Figures enclosed by parentheses are acreages removed (plant sites and roads) for life of projects. Land disturbance acreages also include areas disturbed outside the STSA, consisting mainly of plant sites and spent sand disposal areas.

[a]Total acres disturbed refers to total area that would be disturbed for life of projects.

[b]Measured delineated areas of riparian are shown; additional, small areas occur throughout the area of influence that are not mappable due to map scale.

[c]Acreage not determined because specific locations of facilities are unknown at this time.

[d]Total lease area to be converted.

Indian ricegrass, galleta, salina wildrye, western wheatgrass, and squirreltail. Forage capacity is most commonly low. (The specific area of this vegetation type affected by the interrelated Chevron project's spent sand shale disposal area is dominated by big sagebrush.)

This vegetation type is used for limited livestock grazing and wildlife.

It is estimated that from 10 to 20 years would be required for areas of this vegetation type to recover to preconstruction condition. Grasses and forbs are expected to become adequately established within 5 years.

Pinyon-Juniper (4,672 acres disturbed collectively, 4,872 acres disturbed cumulatively)

Pinyon-juniper type occurs in the semidesert and upland zones within the area of influence. Species composition changes with elevation, slope, and aspect. Juniper trees are the major species, with pinyon pine increasing with elevation and precipitation to a point where it dominates the upper extremes of the area. Common species include Utah juniper, pinyon pine, black sagebrush, birchleaf mountain mahogany, mormon tea, big sagebrush, and some Gambel oak. Grasses included are salina wildrye, galleta grass, western wheatgrass, and blue grama grass.

These areas are used for livestock grazing and wildlife. Some wood products are used for firewood. Vegetation manipulation (chaining) has been conducted on this vegetative type within the area of influence with successful results.

It is predicted that the recovery time for this type would be 30 to 50 years. Grasses and forbs are estimated to become adequately established within 5 years.

Sagebrush-Grass (4,744 acres disturbed collectively, 4,832 acres disturbed cumulatively)

The sagebrush-grass type most commonly occurs on benches, mesas, and park-like areas above 6,200 feet. This type is characterized by an overstory of sagebrush. The dominant sage is mainly big sage (*Artemesia tridendata*), low sage (*A.arbuscula*), or black sage (*A.nova*).The main understory grasses are salina wildrye, Letterman needlegrass, Thurber needlegrass, and western wheatgrass.

These areas provide for domestic livestock and wildlife.

It is predicted that from 10 to 20 years would be required for recovery of this type. Grasses and forbs are estimated to become adequately established within 5 years.

Mountain Shrub (11,082 acres disturbed collectively, 11,222 acres disturbed cumulatively)

The mountain shrub type consists of several plant communities that are characteristic of the grassy, convex ridge tops, and brush-covered sideslopes. Most dominant species include mountain big sagebrush, Utah service berry, Gambel oak, birchleaf mountain mahogany, cliff rose, Woods rose, snowberry, Letterman needlegrass, needle and thread grasses, bluegrass, slender wheatgrass, western wheatgrass, Indian ricegrass, and forbs.

These areas provide forage for domestic stock and are critical to wildlife.

It is estimated that from 20 to 30 years would be required for areas of this type to recover from disturbance. Grasses and forbs are expected to become adequately established within 5 years.

Aspen (4,107 acres disturbed collectively, 4,480 acres disturbed cumulatively)

The aspen type consists mainly of quaking aspen, cottonwood, mountain shrubs, such as snowberry and wild current, mountain brome, and other grasses and forbs. Conifer trees are included within the aspen type. This vegetation type is found on north aspects in irregular patterns where moisture is more favorable. In degraded areas, stands consist of a few old trees and a sagebrush understory.

Aspen sites are of great importance, as they are productive in terms of forage production, hold snow on watersheds, and provide a unique microclimate for the characteristic understory. These areas are also critical as wildlife habitat.

It is predicted that recovery of disturbed areas of this type would require 25 to 45 years. Grasses and forbs are expected to become established within 5 years. The preconstruction diversity of occurrence would be altered due to topographic changes caused by surface mining.

Mixed-Conifer (8,220 acres disturbed collectively, 9,049 acres disturbed cumulatively)

The mixed-conifer type consists of several plant communities that are characteristic of the north-facing, steep-sloping mountain sideslopes and ridges, as well as elevations above 8,200 feet and more moist precipitation zones. Most common species are Douglas fir, Englemann spruce, and some white fir, with an understory of mountain mahogany, snowberry, and fescue.

Most of this vegetation type is used for limited grazing, some firewood and poles, and for wildlife. Timber stands are most common on steep and very steep slopes (30 to 70 percent) and are mainly inaccessible. These woodlands have been determined to be not of commercial value (BLM 1980b).

It is predicted that 30 to 50 years or more would be required for disturbed areas in this type to recover. It is estimated an adequate grass cover would be established within 5 years.

Threatened and Endangered Plants

The Fish and Wildlife Service (FWS) indicates that 1 federally listed endangered plant could occur on the

main block of the STSA—the Uinta Basin hookless cactus (FWS letter, Appendix A-8). Specimens of this plant could be eliminated by construction activities and as a result of trampling or collecting by increased numbers of people who would access the area as a direct or indirect result of conversion-related development.

Reclamation

Reclamation and revegetation of the surface mine disturbance would be difficult in most of the area. Intensive erosion control, reclamation, and revegetation measures and procedures would be required, especially in areas of very steep slopes and shallow, rocky soils. Soil reconstruction potential for revegetation is poor to fair due to unfavorable soil properties, including a large volume of rock fragments, and shallow depths over bedrock.

Moisture is adequate in most of the proposed surface mine area, varying from 12 to 30 inches. Most of the proposed mining activity would occur in the 16- to 30-inch precipitation area.

The applicants' proposed reclamation programs have been evaluated (Appendix A-7, Reclamation and Erosion Control Programs). Compliance with applicable reclamation measures and procedures would make the surface suitable for plant growth, control surface runoff and erosion, and minimize visual impacts.

Soil losses are expected to be minimized by implementation of effective erosion control measures, reconstruction of the soil (plant growth media), and revegetation of understory plants (grasses and forbs) to provide stability and soil protection. Approximately 78 percent of the soils within the area are dominantly shallow to moderately deep over bedrock, contain varying amounts of rock fragments (15 to 70 percent by volume), occur on steep and very steep slopes, and are in land capability Class VII (SCS 1961). These soils generally are poor sources for large quantities of suitable plant growth materials. However, soil productivity is expected to be reclaimed to preconstruction levels and possibly enhanced assuming compliance with an intensive soil reconstruction and reclamation program. This is due to the low preconstruction soil productivity, the reduction of steep and very steep slopes (30 to 70 percent slopes) to slopes of 30 percent and less, and the favorable average annual precipitation throughout most of the proposed conversion areas. At a minimum this would ensure reestablishment of a cover over most disturbed areas. Some steep localized areas (about 5 to 8 percent) resembling talus-like slopes could remain. These areas would equate to the preconstruction occurrence of rock outcrop area (canyon walls and escarpments) in extent. The reconstructed slopes would be less than 30 percent, creating more favorable water infiltration rates. It is estimated the reconstructed soils would generally be deep and would have surface textures ranging from sandy loam to loam with varying amounts of rock fragments. The reconstructed soils would have a higher available water-holding capacity than the original soils, which would provide for more favorable plant growth conditions that would potentially be more suitable for grass production.

The success of revegetation would depend on the success of restoring and/or enhancing the soil conditions as discussed above. Revegetation potential would be greatest in areas of higher average annual precipitation (refer to Map 3-2 showing climatic zones). It is estimated that successful understory revegetation (establishment of grasses and forbs) could occur within 3 to 5 years, especially in Climatic Zones C, D, E, and F. A greater risk of a revegetation time in excess of 5 years (which would exceed the significance criteria) could occur in Climatic Zones A and B; however, grass establishment could still be expected within the 5-year period, assuming more intensive use of effective seed bed preparation, planting techniques, and soil protection measures. Establishment of understory vegetation (grasses and forbs) would provide successful stabilization of the land surface.

In areas with surface mine disturbance, changes in topography and aspect would affect the local microclimate, which would cause changes in plant communities. Surface mining and the associated reclamation activities would change the predominantly steep and very steep preconstruction landscape to a rolling to hilly terrain with reduced aspect influence and reduced elevations (reductions of 200 to 500 feet, depending on the thickness of the tar sand and the overburden replacement). Preconstruction plant diversity requiring specialized microenvironmental conditions would be precluded from reestablishment on the reclaimed surface mine areas, which would be a significant impact based on the impact significance criteria. Mainly shrubs and trees, especially aspen and conifer vegetation types, would be most significantly affected.

Competition with grasses and forbs also would delay the establishment or encroachment of woody plants. Grasses would be a significant part of the reclamation effort. An increase in forage production is expected where more of the area supports a grass-type vegetation with less tall shrubs and trees.

The loss of the natural intricate vegetation type diversity due to alteration of soils, topography, and microclimate conditions would not reduce production; however, the loss of diversity would change the suitability for wildlife habitat and change the aesthetic value of the area (Section 3.A.9, Agriculture; Section 3.A.6, Visual Resources; and Section 3.A.4, Wildlife).

Revegetation of the spent sand disposal areas would be the most difficult, requiring intensive reclamation measures especially on the sites located in Climatic Zone B. Due to the chemical and physical properties of the spent sand, special agronomic measures would be required to provide for a favorable plant growth media that is capable of producing a grass-mixed shrub type vegetative cover to stabilize the disposal site (Appendix A-7, Reclamation and Erosion Control Programs).

One of the two proposed disposal sites in Climatic Zone B would be located in a vegetation manipulation area where the pinyon-juniper has been chained to provide for a more favorable and productive grass-type vegetative cover. The other site would be located in sage/grass and desert shrub area.

The spent sand disposal sites to be located within the mountain area would be valley fill types and would have only limited areas of steep side slopes. The smoother slopes and more favorable climatic conditions would reduce the risk involved in achieving successful vegetation, so these areas would not require as intensive reclamation measures as the steeper sloping areas.

Revegetation of the 6,000 acres that would be disturbed by the in-situ process is expected to be successful due to smoother slopes and more favorable precipitation.

3.A.4 WILDLIFE

Impact Significance Criteria

Adverse impacts to wildlife species due to habitat removal and associated surface disturbances were considered to be significant if more than 10 percent of the total available crucial habitats (for example, high priority summer and winter ranges, critical summer and winter ranges, calving/fawning areas, leks, nesting and brooding areas) would be disturbed. Indirect impacts caused by human population increases were considered to be significant if the estimated increases in poaching, wanton killing, illegal purchase (or nonpurchase) of hunting or fishing licenses and harassment would exceed 15 percent over present levels. The above percentage figures were developed through professional experience and input from knowledgeable wildlife biologists based upon current understanding of critical habitat distribution and use and estimates of local poaching, wanton killing, harassment levels, and fraudulent purchase of licenses.

Impacts to threatened or endangered species are considered on a case-by-case basis as part of the Fish and Wildlife Service (FWS) Section 7 consultation process. In the EIS, any impacts to listed species would put the affected species in a "may affect" category, which automatically elevates the anticipated impact into formal consultation with the FWS.

Wildlife Habitat

Primary wildlife habitat types (vegetation types) found in the STSA and descriptions of the various plant communities within each type are noted in Section 3.A.3, Soils and Vegetation. Some of the wildlife species that would be found in the STSA and their occurrence by habitat type are identified in Table 3-11.

From the standpoint of animal diversity and numbers of individuals per acre, probably the most important wildlife habitat type in the STSA is the aspen type (BLM 1982), followed closely by the riparian habitat type, in spite of its limited acreage. In this area, aspen is noted as a unique and limited, high value wildlife habitat. The type supports an exceptionally

TABLE 3-11
SELECTED TERRESTRIAL AND AQUATIC SPECIES AND THEIR PREFERRED HABITATS IN THE AFFECTED AREA[a]

	HABITAT TYPE[b]						
Species	**Pinyon-Juniper**	**Sagebrush-Grass**	**Mountain Shrub**	**Aspen**	**Mixed Conifer**	**Riparian**	**Aquatic**
Big Game							
Mule Deer	X	X	X	X	X	X	
Wapiti (Elk)	X	X	X	X	X	X	
Black Bear	X	X	X	X	X	X	
Mountain Lion	X	X	X	X	X	X	
Small Mammals							
White-tailed Jackrabbit	X	X	X				
Black-tailed Jackrabbit	X	X	X				
Snowshoe Hare			X	X	X	X	
Mountain Cottontail		X	X				
White-tailed Prairie Dog	X	X					
Uintah Ground Squirrel	X	X	X				
Northern Pocket Gopher			X	X	X		
Deer Mouse	X	X	X	X			
Coyote	X	X	X	X	X	X	
Red Fox	X	X	X	X	X	X	
Badger		X	X	X			
Bobcat	X	X	X			X	
Birds							
Sage Grouse	X	X	X			X	
Blue Grouse		X	X	X			
Mourning Dove	X	X	X			X	
Great Horned Owl	X	X	X	X	X	X	
Cooper's Hawk	X	X	X	X	X	X	
Golden Eagle	X	X	X			X	
Ferruginous Hawk	X	X					
Prairie Falcon	X	X	X				
Mountain Bluebird			X	X	X		
Green-tailed Towhee	X	X	X				
Sage Sparrow	X	X					
Mallard						X	X
Threatened or Endangered Federal List							
Bald Eagle	X	X				X	X
Peregrine Falcon		X	X	X	X	X	
Black-footed Ferret	X	X					
Colorado Squawfish							X
Aquatic Species							
Cutthroat Trout							X
Rainbow Trout							X
Brook Trout							X
Utah Chub							X
Flannelmouth Sucker							X

[a]Preferred habitats by species based on **Vertebrate Species of Southeastern Utah** (Dalton et al. 1978).
[b]Refer to Section 3.A.3, Soils and Vegetation, for a description of the various vegetative types.

large diversity of wildlife species, particularly nongame birds. Aspen communities are also invaluable for providing cover and forage in the summer and fall for big game species.

The aspen type is found on an estimated 13,390 acres within the main block of the STSA or about 14 percent of the main block. Collectively, the projects would disturb about 4,107 acres of the 13,390 acres in the main block (31 percent), while 4,480 acres would be cumulatively disturbed (33 percent) on the proposed lease conversion areas. However, even though the aspen type forms only a very small portion of the total wildlife habitat available, the importance of this type to all wildlife species in this area cannot be overemphasized.

The pinyon-juniper habitat within the main block of the STSA is an important habitat type for many species of wildlife, including many species of nongame birds. This type furnishes important deer winter range and provides home for several species of predators, which prey on the many species of small mammals found here.

The sagebrush-grass habitat type is an interspersed type which furnishes food and cover on a year-round basis to mule deer, elk, many small mammals, predators, and birds. It is very important from the standpoint of providing forage diversity for grazing and browsing wildlife species.

The mountain shrub habitat type is occupied by several big game species, large predators, and many rodents and small, nongame birds. It also furnishes winter cover in its lower elevations.

The mixed conifer type is typical of the north slopes and higher elevations in the main block of the STSA. This type furnishes thermal cover for big game species and nesting habitat for many small birds and raptors. It is utilized mainly for cover rather than forage.

While small in terms of numbers of acres within the main block of the STSA, the riparian habitat type is extremely important to many species of wildlife, particularly small, nongame birds and small mammals. Big game, raptors, and small predators also heavily utilize this type.

Based on the impact significance criteria for wildlife habitats and the analysis of impacts, it is anticipated that significant adverse direct and indirect impacts would occur to wildlife habitat. Direct losses would include habitat that is actually removed by mining operations and construction of processing plant, spent sand disposal, and ancillary facilities. Losses of habitat that could be classed as indirect would occur within a "zone of influence" around the mining area that are not physically removed, but become temporarily unuseable by wildlife because of isolation, noise, dust, and similar factors.

In addition, aquatic habitat would be directly affected in streams subject to flow depletion, water quality change, or temperature change.

Habitat disturbances associated with the proposed conversion of existing oil and gas leases and the resulting development of tar sand would collectively affect an estimated 6,500 acres at any one time (Table 2-1, Chapter 2) and a total of 35,945 acres over the life of the projects. Considering the effects of the interrelated projects in addition to the proposed actions, a total of 38,845 acres of habitat would be cumulatively affected. Cumulative acres disturbed at one time would be the same as collective, except that the number of disturbed acres would increase a little faster and peak out at 7,050 for 2 to 3 years then return to 6,500 for the remainder of the project life.

The loss of wildlife carrying capacity for various species would be associated with the loss of these acres of habitat. Estimates of acres of habitat lost in the "zone of influence" cannot be quantified at present levels of knowledge, as each species of animal has its own tolerance for human activities and most of these tolerances are not known at the present time. Knowledge is sufficient, however, to determine that impacts would occur.

Terrestrial Wildlife

On long-term projects such as these which have reclamation proceeding concurrently with commercial mining operations on adjacent lands, acres of wildlife habitat disturbed by the projects should be analyzed from two viewpoints. First, the total number of acres disturbed at any one time should be determined, as these are areas of habitat that, for all practical purposes, are unuseable by current resident species of wildlife because the vegetative habitat has been altered. Second, the total number of acres of habitat disturbed over the life of the projects should be determined, as these are acres of habitat that, while they are reclaimed to some type of vegetative cover, are not at preconstruction levels of production or diversity. Thus, they are below preconstruction carrying capacity for certain species of wildlife.

The establishment, through reclamation practices, of understory plant species is predicted to be complete after a 5-year period; however, complete vegetative recovery to preconstruction production levels would take 20 or more years (see Section 3.A.3, Soils and Vegetation). Initial reclamation serves only to stabilize soil erosion and to establish ground cover. Reseeded plants that would replace destroyed native wildlife forage and cover species such as bitterbrush, mountain mahogany, coniferous cover, etc., would not become established or productive for 20 years or more. Therefore, impacts to existing wildlife habitats would last much longer and would

encompass a larger area than indicated by acres disturbed at any one time. Estimates of total acres of habitat disturbed at any one time on a steady-state basis are somewhat misleading, as they tend to mask the total length of time required to reestablish wildlife habitat to preconstruction production levels.

Big Game

Mule deer are widespread throughout the STSA and surrounding areas. Deer herd unit 27B (Utah Division of Wildlife Resources (UDWR) designation) is the deer herd unit that includes the STSA. All population estimates, harvest levels, and seasonal ranges considered in this EIS are based on data particular to unit 27B. Mule deer herds in this area are believed to be below carrying capacity and are slowly increasing in size (UDWR 1982).

Table 3-12 lists seasonal ranges in deer herd unit 27B, periods of use, acreages, and current population estimates. Limited wildlife studies have not identified any specific fawning areas in the STSA; however, parturition (birthing) is presumed to occur at the upper levels of winter range between May 15 and June 15. Critical winter range areas are usually located on benches and canyons at lower elevations of deer range between 6,000 and 7,500 feet elevation. Specific migration routes to and from winter ranges in the STSA have not been identified by any wildlife studies to date.

Of the 266,944 acres of high priority summer deer range in the herd unit (Table 3-12), there are approximately 88,926 acres of this type of deer range found in the main block of the STSA (Map 3-3, map pocket). In this area of Utah, summer range for deer and elk is the limiting habitat type. Development of the proposed conversion leases collectively would disturb about 27,296 acres, which is about 11 percent of this type of deer range in the herd unit. About 30,196 acres of this type of deer range (16 percent) would be cumulatively disturbed by conversion-related development plus the interrelated projects (Table 3-13).

Mining activities and loss of habitat would displace some of the mule deer inhabiting the main block of the STSA into surrounding areas. This displacement

TABLE 3-12
BIG GAME SEASONAL RANGES, ACREAGES, USE PERIODS, AND CURRENT POPULATION ESTIMATES WITHIN THE AREA OF INFLUENCE

Species and Area	Season of Use	Period of Use	Acreage[a]	Current Population Estimate[a]
Mule Deer Herd Unit 27B[b]	High Priority Summer	May 16 to Oct 31	266,944	11,057
	High Priority Winter	Nov 1 to May 15	628,324	4,744
	Critical Winter	Nov 1 to May 15	125,406	6,414
	Yearlong	Jan 1 to Dec 31	1,074,148	11,400
Elk Range Creek Unit[b]	Summer	May 16 to Oct 31	80,640	100 (estimate 10% of carrying capacity of Unit)
	Winter	Nov 1 to May 15	199,296	

[a]Personal communication, Larry Dalton, Game Biologist, Utah Division of Wildlife Resources, Price, Utah.
[b]From big game management unit maps, Utah Division of Wildlife Resources, Salt Lake City, Utah.

TABLE 3-13
WILDLIFE HABITAT DISTURBANCES
(Proposed Actions)

Habitat Type	Collective Disturbance Acres	Collective Disturbance Percent of Herd Unit	Cumulative Disturbance Acres	Cumulative Disturbance Percent of Herd Unit
Acres Disturbed in the STSA	35,945	NA	38,845	NA
Mule Deer Habitat				
High Priority Summer Range	27,296	11	30,196	16
High Priority Winter Range	1,500	<1	3,839	1
Elk Habitat				
High Priority Summer Range	18,301	23	30,244	38
High Priority Winter Range	10,495	6	14,765	8
Black Bear and Mountain Lion Yearlong Range	35,945	2	38,845	3
Feral Horse Range	6,320	NA	10,760	NA
Small Mammal Habitat	35,945	NA	38,845	NA
Reptile Habitat	35,945	NA	38,845	NA
Sage Grouse Habitat				
Yearlong	9,980	NA	9,980	NA
Nesting	557	NA	557	NA
Forest Grouse Habitat	35,945	NA	38,845	NA
Non-game Bird Habitat	35,945	NA	38,845	NA

Note: NA = not applicable to the deer herd unit; < = less than.

could result in population losses due to increased competition and stress. The actual loss to the mule deer resource actually would be much larger than the initial number of animals displaced, since the progency of these animals, and subsequent progency, also would be lost to hunters and nonconsumptive users.

If it is assumed that mule deer are distributed equally over their available seasonal ranges, the proposed actions would displace an estimated 2 percent of the deer in herd unit 27B into adjacent areas per year. However, since preconstruction forage production would not be attained for 20 or more years (see Section 3.A.3, Soils and Vegetation), the potential exists to displace 11 percent of the deer herd. If the nearby areas were at carrying capacity, from 2 to 11 percent of the mule deer in the herd unit could be lost over the life of the projects. It must also be remembered that habitat disturbances would occur over a 74-year period and some areas would not be returned to preconstruction production levels for 20 years or more beyond this.

Increased losses of mule deer also would occur due to increased automobile traffic, harassment, wanton killing, and increased poaching. It is estimated that by 1990 these losses could increase about 26 percent over present levels (based upon human population projections in Table 3-5, Section 3.A.2,

Socioeconomics) due to the collective effects of the proposed actions. Considering the interrelated projects in addition to the proposed actions, cumulative losses would increase about 53 percent over present levels by 1990.

The popularity of this area as a mule deer hunting area is evidenced by information in Table 3-14 (Section 3.A.5, Recreation Resources), which indicate estimated harvest, hunting pressure, and expenditures during the 1978 to 1982 period. According to these data, developed by the UDWR, an estimated 10,286 mule deer hunters spent an estimated $2,915,777 in the Carbon County area during the 5-year period. An estimated 11 percent reduction in deer herd size as a result of proposed tar sand developments could result in a corresponding reduction in monies spent by deer hunters in Carbon County.

Both summer and winter elk ranges and calving areas are located in the main block of the STSA. The use period for summer ranges occurs mainly from mid-May to the end of October, with winter range use from November 1 to mid-May (Map 3-4, map pocket). Calving takes place primarily between May 20 and July 1. At the present time, the elk population in the main block of the STSA is believed to be increasing. However, because the elk population is newly established, the majority of potential elk winter range is presently unoccupied. Summer elk range is primarily located above 8,500 feet elevation and also is not fully occupied. Specific migratory routes between the seasonal ranges are not well defined at the present time.

The main block is located in the Range Creek elk herd unit (UDWR designation), which contains an estimated 80,640 acres of high priority summer elk range (Table 3-12). An estimated 62,956 acres of this type of elk range occur in the main block of the STSA. Of these acres, it is estimated that the collective impacts of the proposed actions would disturb about 18,301 acres, which is about 23 percent of this type of elk range in the herd unit. The cumulative impacts of the proposed actions plus the interrelated projects would affect 30,244 acres or 38 percent of the elk summer range in the herd unit.

Human activities associated with the mining and the loss of habitat would displace an estimated 10 percent of the elk in the main block of the STSA on about 6,500 acres per year. However, since preconstruction forage production would not be attained for 20 or more years (see Section 3.A.3, Soils and Vegetation), the potential exists to displace about 23 percent of the elk into nearby areas. At present population levels in the herd unit (Table 3-12), this would be an insignificant impact. However, the long-range plan of the UDWR for this elk unit is to increase the herd size to about 800 animals. Implementation of the proposed actions would increase the number of years needed to reach this herd objective and would reduce income and harvest.

Deer herd unit 27B is known as an excellent area to hunt both black bear and cougar. It is estimated that about 25 percent of the yearly statewide cougar harvest is taken from unit 27B (UDWR 1983). Since both of these animals tend to shun human activities, mining activities in the main block of the STSA would serve to push resident and transitory bears and lions completely out of the area and would reduce harvest and nonconsumptive use opportunities in the STSA for the life of the projects.

Desert bighorn sheep are occasional visitors to the eastern portions of the STSA, most commonly found in Rock Creek, Jack Creek, Flat Canyon, and on Steer Ridge. The proposed actions would cause no direct disturbance to habitat on bighorn sheep range. However, secondary impacts such as traffic, harassment, and poaching could cause the sheep to completely abandon current ranges west of the Green River and north of Interstate 70 (UDWR 1983b). These animals currently do not have a strong population in this area, and disturbances could jeopardize the existing population.

Small Game and Furbearers

Two subspecies of cottontail rabbits are found in the area. The mountain cottontail is found in loose rock areas and along cliffs in sagebrush and mountain shrub areas at elevations between 6,000 and 9,000 feet, utilizing these areas on a yearlong basis. The desert cottontail is found on the open plains, foothills, and low valleys in the more open mixed desert shrub areas. These two subspecies furnish considerable sport hunting for many people, as evidenced by the estimated $1,302,080 spent by an estimated 9,381 cottontail rabbit hunters in Carbon County during the 1978 to 1982 period (Table 3-14, Section 3.A.5, Recreation Resources).

The collective disturbance of 35,945 acres of wildlife habitat would result in losses to cottontail rabbit populations. If it is assumed that cottontails occur

equally over their habitat in the main block of the STSA, it can be estimated that losses due to mining could total 43 percent of the main block cottontail population. Cumulative impacts of the proposed actions and interrelated projects are estimated to disturb about 38,845 acres of cottontail rabbit habitat, which could reduce the cottontail population about 46 percent.

Snowshoe hares are distributed generally within the aspen-conifer zone of the mountainous areas within and near the main block of the STSA. Some sport hunting of this species occurs, with an estimated 910 hunters spending an estimated $99,499 in Carbon County during the 1978 to 1982 period (Table 3-14, Section 3.A.5, Recreation Resources).

Snowshoe hare populations would be disturbed on an estimated 16,571 acres of habitat as a result of the collective impacts of the proposed actions, an estimated habitat reduction of about 31 percent. Cumulatively, the proposed actions and interrelated projects would disturb about 20,542 acres of showshoe hare habitat, a reduction of about 38 percent.

While these losses would appear to be heavy, the high reproductive potential of these species would enable them to quickly repopulate the area after reclamation is completed. It should be noted, however, that habitat for snowshoe hares would take a much longer time to develop; and since many of the steeper, conifer-covered slopes would be forever altered, snowshoe hare habitat may never develop again in the affected area, thus virtually eliminating this species from the main block of the STSA.

A large variety of furbearers, predators, and numerous small mammals are found in the area. There are at least 82 species of small mammals that could be found on and in the vicinity of the main block of the STSA (Dalton et al. 1978).

Removal of most of the topsoil and favorable plant-growth material on about 35,945 acres and storage of this material for later reclamation would cause direct mortality to small burrowing rodents. Losses due to these and other mining activities not only would result in direct mortality, but losses also would be caused by displacement of more mobile animals. Losses of small mammals on about 35,945 acres over the life of the projects would be heavy, but the high reproductive potential of these species indicate that repopulation of reclaimed mine areas would be rapid. If it is assumed that the various species are spaced evenly within the affected area, an estimated 43 percent of the small mammal population on the main block of the STSA would be lost due to the proposed actions. Considering the interrelated projects in addition to the proposed projects, an estimated 38,845 acres would be disturbed cumulatively, resulting in a predicted loss of about 46 percent of the small mammal population in the STSA.

The revegetation of mined out areas to a grass complex also could result in a different small mammal population, since small mammals that frequent shrub habitat would not infiltrate back into a reclaimed area planted to grass (Schroeder 1978).

Reptiles and Amphibians

The main block of the STSA does not have a great number of reptiles, although there are about 15 species found in this area. Because aquatic habitat is lacking in the area, amphibian numbers are relatively low, with an estimated 5 species occurring here (Dalton et al. 1978).

The principal reptile species that possibly could be adversely affected by the proposed actions include sagebrush lizards, side-blotched lizards, night snakes, and gopher snakes. Data on population densities of these species are not available for this area of Utah. However, if it can be assumed that reptiles space themselves equally over the 35,945 acres that would be disturbed by the proposed actions, collective losses of these species could total 43 percent of the reptile population on the main block of the STSA. The cumulative losses of these species on 38,845 acres could total 46 percent of the main block population.

Aquatic habitat for amphibians also is limited in the main block of the STSA. The Grassy Trail Creek area has the greatest amount of wet areas and riparian vegetation. For this watershed alone, a total of 23 springs out of 23 known springs would be lost due to the collective impacts of the proposed actions.

One spring is predicted to be lost in Range Creek and none would be lost in tributaries to the Green River. There are 38 known springs in these 2 areas Section 3.A.1, Water Resources). Based upon this knowledge, it is estimated that, collectively, about 3 percent of the amphibian habitat would be totally lost in the main block of the STSA; thus, the amphibian population could be reduced at least 3 percent over

present levels. Impacts to springs and aquatic habitat associated with the springs due to the cumulative impacts of the proposed actions and interrelated projects would be similar (Table 3-2, Section 3.A.1, Water Resources).

Birds

An estimated 243 species of birds are found in the STSA, of which 236 species are not hunted. From the standpoint of harvest and hunter effort, the mourning dove and ring-necked pheasant are the major game birds found in and near the main block of the STSA (Table 3-11). The pheasant is found only in the agricultural areas around Price and along the Price River, and is not found within the main block of the STSA. However, an estimated 5,636 acres of agricultural lands that support certain wildlife species (ring-necked pheasants, nongame birds, and some waterfowl species) would be lost to these animals because of conversion to homesites and other urban developments. This is an estimated 60 percent of this type of wildlife habitat in the Price-Wellington-Sunnyside area. This would be a significant reduction in this type of habitat.

Sage grouse are the major game bird that could be significantly affected by the proposed actions. Sage grouse populations in Carbon County have been slowly declining over the past 3 years (BLM 1983, UDWR 1983), and hunting of this species was closed in Carbon County during 1981 and 1982.

Sage grouse are found on the STSA year-round, and much of the area is of critical importance to sage grouse because of strutting grounds, nesting and brooding habitat, and wintering areas (Map 3-4, map pocket).

There are an estimated 46,534 acres of yearlong habitat for sage grouse in the STSA. Included within these acres are an estimated 15,104 acres of nesting habitat that is associated with 6 known strutting grounds (leks) (Map 3-4, map pocket). Tar sand recovery activities associated with the proposed actions and interrelated projects would destroy an estimated 9,980 acres of yearlong habitat (21 percent of this habitat on the STSA), and an estimated 557 acres of nesting habitat (4 percent of this critical habitat on the STSA).

In addition, the local population of sage grouse associated with the breeding habitat would be lost. The loss of this breeding population of sage grouse would be a significant adverse impact to the grouse population in Carbon County, because the population is in a declining state at the present time (UDWR 1983).

The proposed actions would disturb an estimated 35,945 acres of blue grouse and ruffed grouse habitat within the main block of the STSA. This is about 43 percent of the forest grouse habitat on the main block and could lead to a 43 percent reduction in the forest grouse population in this area, if the assumption is made that these birds distribute themselves equally throughout their habitat. Considering the effects of the interrelated projects in addition to the proposed actions, approximately 38,845 acres of habitat (46 percent) would be disturbed (Table 3-13).

Upland bird hunting in Carbon County would be affected by an influx of 13,950 mine workers, their families, and people associated with support facilities and residential construction personnel. Hunting pressure would increase an estimated 42 percent due to the collective effects of the proposed actions and 83 percent due to the cumulative effects of the proposed actions and alternatives. (Refer to Section 3.A.5, Recreation Resources, for further discussion regarding hunter competition, etc.)

Nongame species vary from warblers to juncos, all of which probably nest in varying numbers within the main block of the STSA. The most widespread, small, nongame species identified within the area of influence are the horned lark and Brewer's sparrow.

The mountain bluebird, the western bluebird, and the yellow-breasted chat, which are found on the STSA, are of high interest to the UDWR, due primarily to habitat loss and a resulting population decline. Collectively, the proposed actions would cause impacts to these species on 35,945 acres, an estimated 43 percent reduction in habitat for these birds on the STSA. Collectively, the interrelated projects and proposed actions would affect about 38,845 acres, an estimated 46 percent reduction in habitat.

The well-being of 5 other species found on the STSA, the common nighthawk, hairy woodpecker, Bewick's wren, golden-crowned kinglet, and vesper sparrow, may be in jeopardy, according to UDWR. Collective impacts of the proposed actions would disturb 35,945 acres and could reduce populations of these birds an estimated 43 percent, while cumulative impacts may reduce habitats as much as 46 percent.

No systematic raptor inventories have been completed on the STSA to date. However, general distribution maps of raptors indicate that as many as 29 species of raptorial birds could occur on the main block of the STSA at some time of the year.

Nesting and hunting habitat for raptorial birds would be lost on an estimated 35,945 acres of habitat (an estimated reduction of 43 percent) due to the collective impacts of the proposed actions. About 38,845 acres would be disturbed due to the cumulative impacts of the proposed actions and interrelated projects (an estimated 46 percent reduction in habitat).

Since raptors are protected under several federal laws (Bald Eagle Protection Act, Migratory Bird Treaty), disturbances of nests must be cleared with the FWS. Significant impacts, especially to cliff-nesting raptors, are anticipated for the life of the projects. In some areas, cliff nesting sites would be irretrievably lost, and these species would have to find other nesting sites away from the main block of the STSA. If adjacent breeding territories are at carrying capacities, displaced raptors could be lost from the breeding population.

Wild Horses

There are an estimated 6,320 acres of wild horse range located in the northeast portion of the main block of the STSA (Map 3-3, map pocket). Most of these acres would be disturbed by the proposed actions. While these 6,320 acres are only about 10 percent of the wild horse range in the Range Creek Planning Unit, about 90 percent of the horse observations have occurred here. In addition, foaling and critical water supplies are found in the potential disturbance area. Impacts to these areas, then, could have a significant adverse impact to the wild horse population in this area.

Aquatic Wildlife

The streams in the main block of the STSA support a sport fishery consisting of brown, rainbow, brook, and cutthroat trout in suitable habitat. The fishery is limited, but is of local importance. A total of 20 fish species could occur in the area of influence.

The hard-to-reach upper portions of Range Creek and Rock Creek presently support a fair fishery, while Nine Mile Creek is rated as poor. The Green River is also rated as a fair fishery, but access is extremely limited. Cold water fishery habitat may exist in Flat Canyon. Trout have been observed in lower stretches, while young-of-the-year may have been observed in the upper reaches.

None of the perennial stream reaches in the main block of the STSA are stocked by the UDWR (UDWR 1983a). Since these streams are self sustaining and of local importance, an influx of people to this area due to the proposed actions could easily destroy the available fishing. In addition, increased siltation and introduction of warmer water due to mining activities also could eliminate the present, limited, cold water fishery. It is doubtful that after mining is completed the streams left in the main block of the STSA ever could support cold water fishery.

Threatened or Endangered Species

Three federally listed endangered animal species could occur on the main block of the STSA—bald eagle, black-footed ferret, and Colorado squawfish (FWS letter, Appendix A-8). No threatened species are found in this area.

Bald eagles concentrate along the Green River during the winter, using cottonwood trees in the riparian habitat for roosting and perching. This species is not expected to be directly affected by the proposed tar sand developments. However, wintering populations of these birds are very susceptible to wanton killing. Large increases in human population levels would increase the magnitude of this problem. By using a straight-line projection, it is estimated that collectively, the proposed actions would cause wanton killing of bald eagles to increase 42 percent over present levels by 1990; cumulatively, the proposed actions and interrelated projects would cause an estimated 83 percent increase by 1990.

Since there are known colonies of whitetail prairie dogs found in Carbon County, habitat exists for the black-footed ferret. Historically, this endangered animal ranged into northeastern Utah (Hall and Kelson 1959; Gates 1973) and could still exist here. If ferrets are present, they could be killed by construction activities of any kind wherever prairie dog colonies occur on or along project construction areas. Present levels of ferret populations are

thought to be so low that any mortality would reduce population levels significantly.

The peregrine falcon was not included on the Section 7 list of species furnished to the Division of EIS Services by FWS. Unless an amendment list is received from FWS, it has to be assumed the peregrine falcon would not be affected by the proposed action.

The Colorado squawfish has been reported from the Green River. Adverse impacts to this fish are possible as a result of any project that takes water from any stream in the Colorado River system. The magnitude of these losses from the proposed actions cannot be reliably estimated at the present time, but reductions in population size would be significant, since current population levels are low.

Current project descriptions do not contain sufficient information to enable BLM to make a full determination as to whether eventual development of tar sand resources and its potential use of water from the Green River would jeopardize the continued existence of the Colorado squawfish. Therefore, it is necessary for BLM to request Section 7 consultation on certain species on a project-by-project basis as each commercial mine operation plan is developed in detail and submitted. Therefore, as a standard measure, special provisions will be stipulated in all lease documents concerning re-initiation of Section 7 consultation (see Appendix A-3, Existing Oil and Gas Provisions and Required General Measures Designed to Reduce Impacts).

Two birds, one mammal, and one fish are listed as candidate species by FWS: long-billed curlew, ferruginous hawk, spotted bat, and razorback sucker (FWS letter, Appendix A-8).

3.A.5 RECREATION RESOURCES

Impact Significance Criteria

The determination of positive or negative impacts upon the recreation resource is related to user expectation, availability of recreation opportunities, and the recreation setting. These three factors determine whether experiences are high quality and positive, or low quality and negative.

Impacts to recreation resources are considered to be significant if either of the following criteria are met:

> If the user public's short-term sensitivity and perceived concerns about construction activities are high (where the quality of the recreation experiences would be diminished). Short-term is defined to be 1 to 10 recreation seasons.
>
> If the user public's long-term sensitivity and perceived concerns about operation activity is medium to high (where the quality of the recreation experience would fail expectations). Long-term is defined to be 10 years or longer. Closing access into favored dispersed recreation areas or possibly foreclosing a portion of the Green River from potential Wild and Scenic River designation would be considered significant.

Short-term or long-term recreation impacts that are not controversial to the user public would be considered insignificant. For example, impacts to an area not regularly used or not considered of high recreation value would be considered insignificant.

General Dispersed Recreation

The primary form of recreation occurring within the area of influence is known as dispersed recreation. Dispersed recreation experiences include sightseeing, hunting, camping, off-road vehicle use (ORV), fishing, and floatboating on the Green River. No developed recreational facilities are located within the Sunnyside Special Tar Sand Area (STSA).

Impacts to the recreation resource and quality of dispersed recreation experiences would largely be attributed to changes in access, reduction in the recreation land base, and increase in recreation use due to project-induced population growth. Generally, recreation opportunities that would be severely diminished or eliminated by proposed lease operations would eventually be shifted to adjacent public, National Forest, state, private, and Indian Reservation lands.

Over the 74 year collective life of the projects, the proposed actions would disturb approximately 35,945 acres. Over a 40-year period, approximately 6,500 acres at any one time would be eliminated

from dispersed recreation opportunities such as sightseeing, hunting, camping, and ORV use. Considering the interrelated projects in addition to the proposed actions, a total of 38,845 acres would be disturbed over the life of the projects. Cumulative acres disturbed at one time would be the same as collective, except that the number of disturbed acres would increase a little faster and peak out at 7,050 for 2 to 3 years then return to 6,500 for the remainder of the project life.

Bruin Point View Area

Located adjacent to Amoco, Mono, and Enercor proposed conversion areas, the 10,285-foot mountain top provides an excellent view of nearby and distant canyons and mountains. The area is used for informal picnicking and sightseeing, as well as dispersed camping and hunting. It received an estimated 1,000 visits in 1982. The majority of use occurs during midsummer and early fall. In general, recreational use of Bruin Point is largely dependent on road and weather conditions (BLM 1983b).

The suitability of Bruin Point for sightseeing, hunting, camping, and ORV use would be significantly reduced by extensive surface disturbance due to development of the adjacent Amoco, Mono, and Enercor proposed conversion tracts. Public recreational access to Bruin Point as well as areas to the west and north (used primarily for hunting and other forms of dispersed recreation) may not be available due to mining activity.

Hunting and Nonconsumptive Uses of Wildlife

Nearly all big game hunting in the area of influence is for deer. In 1982, an estimated 1,659 hunters were afield within the Sunnyside STSA. Most of the hunting occurred because of good public access to the higher elevation summer range. The primary access from Sunnyside, Utah, is a partially paved, but mostly dirt jeep trail up Water Canyon to Bruin Point. Hunting access to the main block of the STSA also is via Dry Canyon road and Cottonwood Canyon. Hunting is closely associated with dispersed camping during hunting season. A substantial amount of small game habitat, especially for hares, is also known to occur in the area.

Hunting, fishing, and nonconsumptive uses of the wildlife resources in Carbon County, Utah, furnish many days of leisure time to both residents and non-residents. Estimates of total participants, numbers of animals harvested, and participant days are found in Table 3-14.

In spite of present low population levels, the mule deer is a very important trophy and game species in the Carbon County area. In addition to its trophy value, the mule deer is of economic importance to the area because of the numbers of hunters who come to the area. Deer hunters spent about 41,952 days pursuing deer in the Carbon County area while harvesting an estimated 3,006 animals. The food value of the harvested animals was about 300,600 pounds of meat over the 1978 to 1982 period.

Other big game animals hunted in the STSA include the black bear and cougar which furnished an estimated 211 hunter days for 38 hunters while harvesting an estimated 23 animals.

Small game hunters pursued 9 different species in Carbon County with about 27,025 persons spending an estimated 89,167 days harvesting 131,019 animals, while 1,976 waterfowl hunters spent 7,283 days taking an estimated 13,016 ducks and geese.

In 1980, an estimated 22,179 persons resided in Carbon County. Approximately 30 percent of those persons (6,654 persons) were involved in nonconsumptive uses of the wildlife resources in Carbon County (birdwatching, wildlife observations, etc.) (Allred 1976). It is estimated that the numbers of persons involved in these uses of wildlife by 1989 would increase to about 19,212 persons and by 1995 to about 20,448 persons.

Though leisure-time uses of wildlife are anticipated to increase, the overall usage of wildlife and the removal or change in habitats could reduce wildlife populations to the extent that the number of persons involved in various wildlife pursuits could be reduced even under present levels. This could reduce potential benefits from wildlife over the long term (refer to Section 3.A.4, Wildlife, for a more detailed discussion of the anticipated impacts to wildlife).

The effects to hunting and nonconsumptive uses of wildlife would largely depend upon the effects on access and wildlife. Development of the proposed conversion tracts and associated surface disturbance (disturbance from plant sites, spent sand disposal areas, and ancillary facilities) would substantially alter or eliminate user access. The partially paved, but mostly dirt jeep trail from

TABLE 3-14
HUNTER PARTICIPATION IN CARBON COUNTY, UTAH (1978-1982)

Item	Total Participants	Hunter Days	Animals Harvested
Big Game[a]			
Mule Deer	10,286	41,952	3,006
Black Bear	14	77	6
Mountain Lion	24	134	18
Upland Game[b]	27,025	89,167	131,019
Waterfowl[c]	1,196	4,870	9,199
Waterfowl[d]	780	2,413	3,817

Note: Data for this table were developed from various reports derived by the Utah Division of Wildlife Resources for the 1978-1982 period.
[a]No open seasons on elk or bighorn sheep in this area.
[b]Includes 9 species of upland game.
[c]Includes both duck and goose hunters in Carbon County.
[d]Includes only data from the Desert Lake Waterfowl Management Area in Emery County for duck and goose hunters.

Sunnyside up Water Canyon to Bruin Point and beyond would become congested with heavy construction equipment. The health and safety of recreation users using this primary access route to higher elevations would be severely compromised. Surface mining activity would reduce summer deer habitat, thereby reducing deer herd populations. Poaching and other illegal game law violations also would be expected to substantially increase (Bradley 1976). Additionally, project-related population growth would cause an increase in hunter contact throughout the area of influence, which would cause a decline in hunting success and hunter satisfaction. Due to increased hunting activity, the possibility of hunting-related accidents could increase. Hunting pressure on nearby National Forests (Ashley, Fishlake, and Manti-LaSal) and adjacent public, state, and private lands, as well as the Uintah and Ouray Indian Reservation, could increase due to an overall decline in hunting opportunities and quality of the hunting experience within the STSA.

Sightseeing

Sightseeing is another popular recreation activity. An abandoned tar sand tramway (cable car) in Water Canyon provides an interesting sightseeing opportunity. The tramway, constructed in 1929, is approximately 2 miles north of Sunnyside, Utah. Hiking, backpacking, and ORV travel provide high quality sightseeing experiences due to the variety in land form and vegetation. Tributary canyons to Desolation Canyon, such as Rock Creek, Flat Canyon, and Jack Creek, are most scenic based on land forms, uniqueness, color, water, and vegetation.

Sightseeing opportunities would be significantly altered due to changes in access and land disturbance activities. Previous semi-primitive recreation experiences would shift to more semi-urban recreation experiences. However, new or improved access routes could provide additional opportunities for sightseers and ORV users. Mining activity and the processing plants would be a new attraction for sightseers.

Horseback Riding

The T.N. Jensen and Don Wilcox lodge operators provide horseback riding opportunities. Some of this horseback outfitting occurs in conjunction with the Green River floatboating outfitting business. Alteration or elimination of recreation access within the main block of the STSA as a result of tar sand development could affect horseback riding opportunities, especially those originating in the Jensen and Wilcox lodges. Access changes also could increase the distance people would have to drive to reach these lodges.

Fishing and Floatboating

Fishing within the area of influence occurs usually in association with floatboating on the Green River. The Green River provides fishing opportunities for catfish. Both Rock and Range creeks provide good quality trout fishing. Fishing on Rock Creek is accessible to floatboating parties and people using the Van Donesen Trail from the T.N. Jensen and Don

Wilcox lodges. Fishing on Range Creek is accessible by the Little Horse Canyon and Bruin Point roads.

Trout fishing opportunities in Range Creek would likely be significantly affected due to a deterioration of water quality and an increase in water temperature (Section 3.A.1, Water Resources).

Rafting down the Green River through Desolation and Gray canyons, approximately 7 miles to the east of the Sunnyside STSA, is recognized nationally (and internationally to a limited degree) for high quality wilderness floatboating experiences. The 1981 visitor use estimate for Desolation Canyon was 31,815 user days (BLM 1983b).

The Green River, from Range Creek upstream to the Yampa River (a total of 193 miles), has been identified as having national significance, and as a potential candidate for Wild and Scenic River status in the Nationwide Rivers Inventory (National Park Service (NPS) 1982).

Water diversion dam structures, pump houses, access road, and other facilities related to water development could likely jeopardize any potential for Wild and Scenic River designation on the Green River. At best, the Green River would not be classified as "wild," but could possibly be classified as "scenic" or "recreational" under the Wild and Scenic Rivers Act. Diversion dam structures, pump houses, and access roads could also severely diminish the quality of river running experiences due to the incompatability of these "man-made" structures along pristine stretches of the Green River.

A positive consequence would be increased revenues to commercial river runners for the Green River and equestrian outfitters. Increased demand for public and commercial permits to float the Green River would be predicted due to a significant increase on local population numbers. During peak summer usage, the social carrying capacity of the Green River may be met or exceeded due to increased demand for more permits.

Wilderness Recreation

Wilderness-related recreation opportunities in the Desolation and Turtle canyons wilderness study areas (WSAs), and the Jack Canyon Appeal Area (located east and south of the main block of the STSA) include backpacking, camping, and horseback use (refer to Section 3.A.12, Wilderness Resources). These areas are popular due to their topography, color, wildlife, vegetation, and floatboating. The quality of hiking and primitive backpacking experiences in these units would be diminished to a certain degree, especially in the areas immediately adjacent to the STSA boundary where sights and sounds of surface mining activity would be obvious to wilderness recreation users.

The Hill Creek Extension of the Uintah and Ouray Indian Reservation (approximately 20 miles east of the Sunnyside STSA and east of the Green River) is managed to preserve its natural characteristics and provides pristine recreation experiences. Secondary effects causing a slight increase in recreation use due to the displacement of certain recreation users and opportunities (for example, hunting) may occur in the Hill Creek Extension. Population increases associated with the proposed tar sand development could affect the quality of primitive recreational experiences.

3.A.6 VISUAL RESOURCES

Impact Significance Criteria

Impacts were considered significant for visual resources if modifications in the land form and vegetation or the addition of a structure would not meet the standards of the BLM Visual Resource Management (VRM) class for the area where the project would be located.

Impacts were considered to be highly significant if they could be viewed from the valley areas to the west and south of the impact area and if the modifications would not meet the standards of the VRM class in which they would be located.

Setting

The proposed actions and alternatives would occur within the Colorado Plateau's physiographic province, which contains characteristic sets of landscape features including landform and vegetation (Fenneman 1931). These features are used as a basis to determine existing visual values and to determine how changes brought about by the proposed actions and alternatives would affect these visual values.

The physical characteristics (topography and vegetation types) of the main block of the STSA, Mono's mill site (southeast of Sunnyside), and the plant sites and spent sand disposal areas to the west of the main block are summarized in Section 3.A.3, Soils and Vegetation. Existing modifications to the natural landscape in the main block of the STSA are generally limited to a few roads, a communication site, an airstrip, and some mineral exploration and mining activities. Modifications found in the area west of the main block include primitive roads and trails, rural and community development around Sunnyside and East Carbon City, a railroad, and mineral and industrial-related activities. The western escarpments and higher portions of the STSA are highly visible from U.S. Highway 6, State Highway 10, and local roads, as well as a number of local communities, such as Price, Wellington, Sunnyside, and East Carbon City. The landforms provide a background to local foreground and middleground views from the valley highways and communities. The local views are not nearly as dramatic as the background itself, which places added quality on the views.

Impacts

The areas in which the proposed actions and alternatives, including the possible plant sites, spent sand disposal areas, and associated facilities, would be located were evaluated for visual resources using the BLM VRM system (BLM 1978). The system provides a standardized method for identifying and classifying visual resource values.

The analysis of impacts is based upon the BLM Contrast Rating System which determines landscape contrasts that would be created by evaluating the extent that a project would visually contrast with the existing landscape in terms of form, line, color, and textural changes. The extent of contrast is then translated into either adverse or beneficial impacts. Refer to Appendix A-9, Visual Resource Management Methodology, for a further explanation of the system and how it was specifically applied to this project, and definition of terms.

The established VRM classes for the affected area (Map 3-5, map pocket) relate to the physical characteristics of the physiographic province previously described. Maps indicating locations of scenic quality, visual sensitivity, and viewing distances for any specific site can be found at the BLM Price River Resource Area Office. The landscape in 4 of the 5 VRM classes would be affected by the proposed actions. Table 3-15 summarizes existing and significantly affected acres for each class.

In general terms, VRM Class II areas account for the southwest half and the central portion of the main block of the STSA, and the proposed Mono mill site and spent sand disposal area (east of Sunnyside). These areas generally correspond to the most visually sensitive portions of the main block. VRM Classes III and IV account for the classification of the remaining portions of the main block. The other applicants' processing plants and spent sand disposal areas would be located within VRM Class IV areas to the west of the main block. These class areas are most generally unseen by the public, or the landscape features are less diverse. Small segments of VRM Class V areas (less than 1 percent of the area) are infrequently found within the affected area (BLM 1977).

Collectively, the proposed actions would significantly affect 18,932 acres of VRM Class II areas. Cumulatively, the proposed actions plus the interrelated projects would increase the total to 20,332 acres. Collectively, the proposed actions would significantly affect 7,268 acres of VRM Class III areas and 4,050 acres of VRM Class IV areas. Cumulatively, the total would be 7,268 acres of VRM Class III and 5,250 acres of VRM Class IV. The impacts would be undetermined for 2,445 acres collectively, and 2,745 acres cumulatively (these are the acreages that would be required for ancillary facilities whose specific locations are unknown at this time and, therefore, were not analyzed for impacts).

All impacts were considered to be long-term (beyond the life of the projects), because of the long period of commercial operations and length of time necessary to lessen the visual contrast with the existing landscape. Short-term impacts (less than the life of the projects), such as the visual presence of work crews, were not considered.

TABLE 3-15
SUMMARY OF VISUAL RESOURCE EXISTING CONDITIONS AND SIGNIFICANT IMPACTS (Acres)
(Proposed Actions)

	VRM Class II[a]		VRM Class III[a]		VRM Class IV[a]		
Component	Existing[b]	Significantly Affected[c]	Existing[b]	Significantly Affected[c]	Existing[b]	Significantly Affected[c]	Undetermined[d]
Collective Projects							
Mines/In-Situ Development	16,168	16,168	975	975	3,950	3,950	-
Plants	1,139	1,139	3,528	3,528	1,600	100	-
Spent Sand Disposal Areas	1,625	1,625	3,515	2,765	1,000	0	-
Ancillary Facilities	-	-	-	-	-	-	2,445
Total Collective Impacts	18,932	18,932	8,018	7,268	6,550	4,050	2,445
Interrelated Impacts	1,400	1,400(H)	-	-	1,200	1,200	300
Total Cumulative Impacts	20,332	20,332	8,018	7,268	7,750	5,250	2,745

[a]Refer to Appendix A-9, Visual Resource Management Methodology, for definitions of VRM classes.

[b]Acres of existing VRM class in conversion areas included in the proposed actions.

[c]Acres that would be significantly affected under this alternative.

[d]This column indicates the acreages that would be required for ancillary facilities, where specific locations and impacts are unknown at this time. Refer to Appendix A-9, Visual Resource Management Methodology for a further explanation.

(H) = indicates if the impacts are highly significant (can be viewed from the valley to west and south).

Summary

Summarizing the impacts, the highly significant visual impacts which would occur as a result of the proposed actions would include a severely changed skyline of the main block of the STSA which serves as a backdrop to the views from the valley communities and highways to the west and south. Closer to the proposed actions sites, the introduced landform of the spent sand disposal areas would be visible, as would the introduced structures of the plant sites. Over time, revegetation would help lessen the impacts, but would not overcome the contrasts between the present natural and the proposed highly modified landscape. Significant impacts caused by long-term landform, vegetative, and structure additions would be viewed from within the project areas and viewing points surrounding the main block of the STSA to the north and east. All areas in which significant impacts would occur would be reclassified as being in VRM Class V, since rehabilitation would be necessary to restore the landscape to the condition of the surrounding area. Since it would be virtually impossible to restore the extremely modified landform to its present condition, the view from the valley areas would be severely altered forever.

3.A.7 AIR QUALITY

The information discussed in this section is summarized from the **Air Quality Analysis for the Combined Hydrocarbon EIS, Eastern and South-Central Utah-Sunnyside STSA** (Aerocomp Inc. 1983). Copies of this report are available from:

Gene Nodine, District Manager Bureau of Land Management 125 West 200 South P.O. Box 970 Moab, Utah 84532	**or**	Public Room Bureau of Land Management Utah State Office 136 East South Temple Salt Lake City, Utah 84111

Impact Significance Criteria

The significance of predicted impacts was based on the provisions of the Clean Air Act (Public Law 95.95), which established the National Ambient Air Quality Standards (NAAQS) and Prevention of Significant Deterioration (PSD) provisions.

The NAAQS are uniform minimum national standards for air quality, while the PSD provisions give air quality and related values additional protection in areas where existing air quality is better than the minimum required.

The States of Utah and Colorado have ambient air quality standards equal to the NAAQS, as shown in Table 3-16.

The primary standards are intended to protect public health, allowing for an adequate margin of safety. The secondary standards are intended to protect the public welfare from known or anticipated adverse impacts. Public welfare includes effects on soils, water, crops, vegetation, man-made materials, animals, wildlife, weather, visibility, climate, damage to and deterioration of property, and hazards to transportation as well as effects on economic values and on personal comfort and well-being. Thus, comparing the impact to the secondary NAAQS is one way of assessing many air quality impacts.

Other than the standard for ozone, or those based on annual averages, the standards are not to be exceeded more than once per year.

Utah and Colorado areas covered by the PSD provisions of the Clean Air Act are basically divided into two classes. Class I areas are those in which practically any air quality deterioration would be considered significant, thus, allowing little or no major energy or industrial activity in close proximity. Class II areas are those in which deterioration that normally accompanies moderate, well-controlled growth would not be considered significant. Different degrees of degradation of air quality are deemed acceptable in the 2 classes of land. Class I and Class II degradation limits and the secondary

TABLE 3-16
UTAH, COLORADO, AND NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Primary	Secondary
Oxidant (ozone)	1-hour[a]	235 $\mu g/m^3$	[b]
Carbon Monoxide	8-hour	10,000 $\mu g/m^3$	[b]
	1-hour	40,000 $\mu g/m^3$	
Nitrogen Dioxide	Annual	100 $\mu g/m^3$	[b]
Sulfur Dioxide	Annual	80 $\mu g/m^3$	-
	24-hour	365 $\mu g/m^3$	-
	3-hour	-	1,300 $\mu g/m^3$
Total Suspended Particulates	Annual	75 $\mu g/m^3$	60 $\mu g/m^3$
	24-hour	260 $\mu g/m^3$	150 $\mu g/m^3$
Lead	Calendar Quarter	1.5 $\mu g/m^3$	[b]
Hydrocarbons[c]	3-hour (6-9 AM)	160 $\mu g/m^3$	[b]

Note: National standards, other than for ozone or those based on annual averages, are not to be exceeded more than once per year.
$\mu g/m^3$ = micrograms per cubic meter

[a]The number of days during a calendar year in which one or more hourly values could equal or exceed the ozone standard must be less than or equal to 1.

[b]Same as primary standard.

[c]Guideline for Oxidant Control, no longer a national standard.

$\mu g/m^3$ = micrograms per cubic meter

NAAQS (being the most limiting) become the most relevant quantitative criteria to compare the pollutant concentrations resulting from tar sand development.

Colorado has adopted regulations for sulfur dioxide (SO_2) similar in nature to the national PSD provisions. All Federal Class I areas are included in the Colorado Category I classification, although not all Colorado Category I areas are considered in the Federal Class I provisions.

The Clean Air Act defines specific maximum allowable increases over baseline concentrations for only 2 pollutants—SO_2 and total suspended particulates (TSP). Table 3-17 lists those allowable increments.

whether or not the SO_2 or TSP increments would be exceeded. Air quality related values specifically include visibility but may also include flora, fauna, soil, water, odor and cultural-archaeological and geologic resources.

Currently, there are no objective criteria for judging the impact on air quality related values other than the secondary NAAQS. In this study, only visibility impairment is discussed in detail, because it is the only air quality related value considered significant in the planned tar sand developments. Acid deposition and other issues are only briefly addressed.

TABLE 3-17
PREVENTION OF SIGNIFICANT DETERIORATION INCREMENTS

		Maximum Allowable Concentrations ($\mu g/m^3$)		
Pollutant	**Averaging Time**	**Class I**	**Class II**	**Class III**
Sulfur Dioxide	Annual	2	20	40
	24-hour	5	91	182
	3-hour	25	512	700
Total Suspended Particulates	Annual	5	19	37
	24-hour	10	37	75

Note: $\mu g/m^3$ = micrograms per cubic meter.

The state and federal air quality program requirements are quantitative criteria for assessing the significance of air quality impacts of tar sand development. However, this analysis is conducted to satisfy the broader requirements of the National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) regulations and is not designed to satisfy the specific air quality permit processes of the state and federal agencies. Therefore, impact criteria which are not necessarily quantitative have also been considered in the EIS analysis. The Clean Air Act provides for a case-by-case determination of degradation of air quality related values (AQRV's) in mandatory Class I areas that are important to the specific Class I areas,

Worst case analyses approaches such as the one used in this air quality assessment estimate high pollutant concentrations, since worst-case emission and meteorological assumptions are used. These analyses are performed to provide an indication of potential problem areas and magnitude. The location, production, and mining and plant processes assumed in this analysis are projections of possible resource development. The actual rate of resource development and the techniques that would be used to extract the tar sand resource are uncertain at this time for most of the modeled sources. In the interpretation of the results of a worst-case analysis, it is important to consider the results with respect to air quality protection provided

by law. The Clean Air Act requires strong state and federally directed regulatory programs to ensure that no major emitting facility will be constructed if it causes or contributes to NAAQS violations. The PSD program also requires that, in areas where NAAQS are being met, no major emitting facility be constructed if the source will exceed Class II increments. If a proposed facility is shown to exceed Class I increments, the developer must convince the manager of the Class I area that AQRV's will not be adversely affected. The PSD process is an open process that includes substantial public involvement. Thus, the Clean Air Act guarantees that air quality will not deteriorate beyond standards (Dietrich, et al. 1983).

Setting

The air quality analysis area (approximately from Sunnyside, Utah, to the Colorado-Utah border) is principally rural, with light industrial activity; therefore, the existing air quality is very good. Measured TSP matter, SO_2, and nitrogen dioxide (NO_2) concentrations at sites within or near the study area indicate that with the exception of TSP, ambient concentrations are well within the primary and secondary NAAQS. Carbon monoxide (CO) and ozone (O_3) are both below the primary NAAQS. Lead, which has not been monitored in the analysis area, is expected to be within the primary NAAQS due to the lack of major industrial sources of this pollutant and the relatively low number of vehicles in the region.

Measured results indicate that the region experiences TSP annual geometric mean concentrations as low as 15 to 20 micrograms per cubic meter ($\mu g/m^3$) to as high as 60 to 70 $\mu g/m^3$. It is probable that populated areas currently could approach the secondary NAAQS for the annual geometric mean. The measurements also show that the annual maximum 24-hour TSP concentrations currently range from 50 to 400 $\mu g/m^3$. These results demonstrate that isolated areas of the analysis area currently exceed the secondary NAAQS and possibly exceed the primary NAAQS for TSP.

Visibilities in the area of influence are usually good, with seasonal average visual ranges from 140 kilometers (km) (87 miles (mi)) to 229 km (142 mi). Geometric means of visual range at Dinosaur, Capital Reef, and Canyonlands National Parks are 176 km (109 mi), 182 km (113 mi), and 190 km (118 mi), respectively. The background visual range at Cedar Mountain has a mean value of 207 km (120 mi) and ranges between about 100 km (62 mi) and 350 km (217 mi). The good visibility reflects the presently low regional SO_2 and ambient TSP concentrations.

Differences Between Air Quality Analysis and Proposed Actions Description

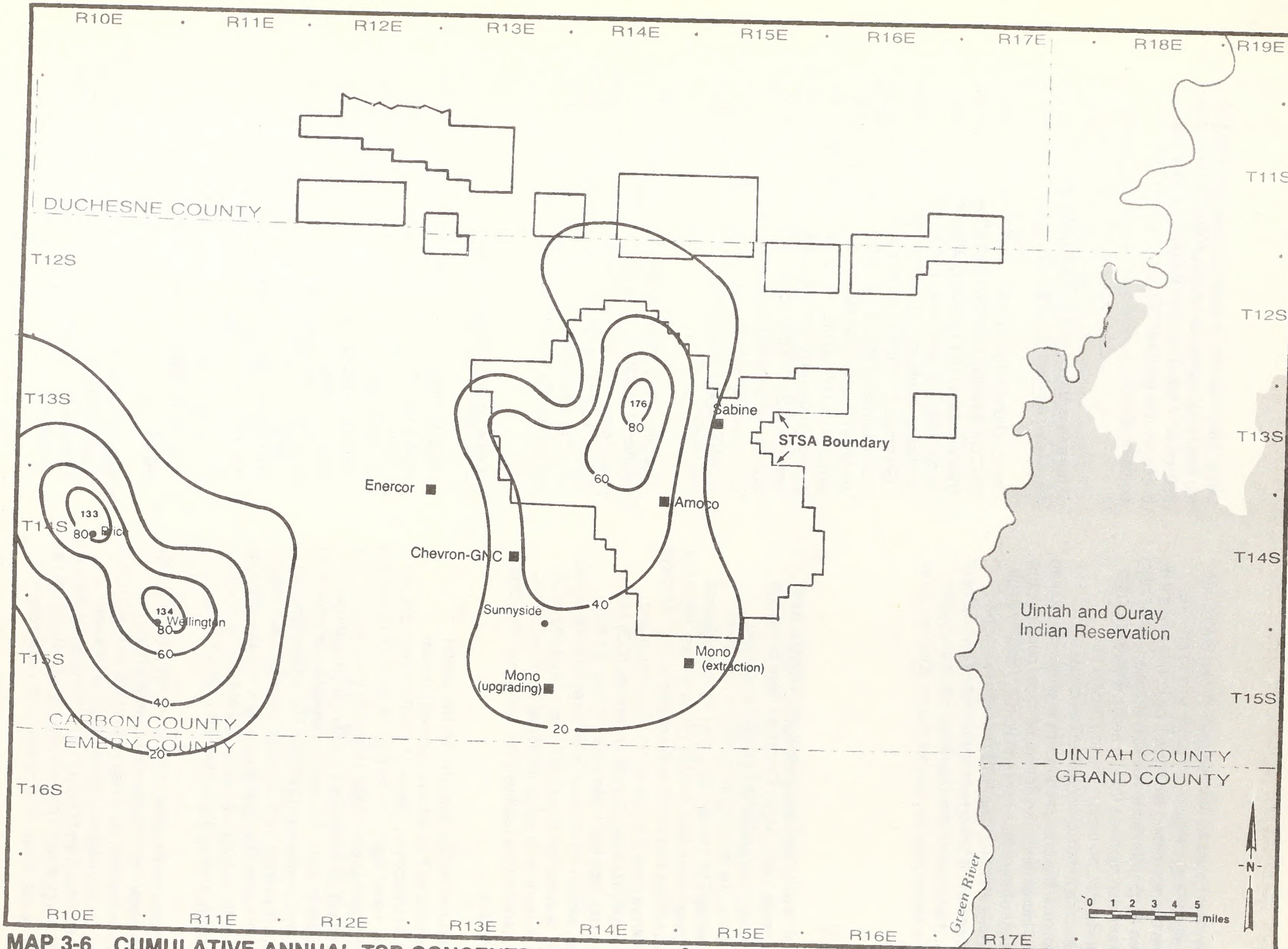
The location and production level for the Chevron-GNC plant facility was changed after the preliminary draft EIS air quality modeling analysis was completed. The result was a difference in the number of applicant-proposed plant sites (5 for the EIS versus 4 for the air quality analysis); the production level for the proposed actions collective analysis (115,000 barrels per day (bpd) for the EIS versus 105,000 bpd for the air quality analysis); the production level for the proposed actions cumulative analysis (125,000 bpd for the EIS versus 115,000 bpd for the air quality analysis); the location for the Chevron interrelated plant facility (new location for the EIS versus the old location for the air quality analysis).

The differences were analyzed with respect to the predicted results. It is the opinion of the BLM and Aerocomp, Inc. that the change in the impacts would not be significant, because air quality impacts for the proposed actions are primarily caused by projects other than the Chevron projects.

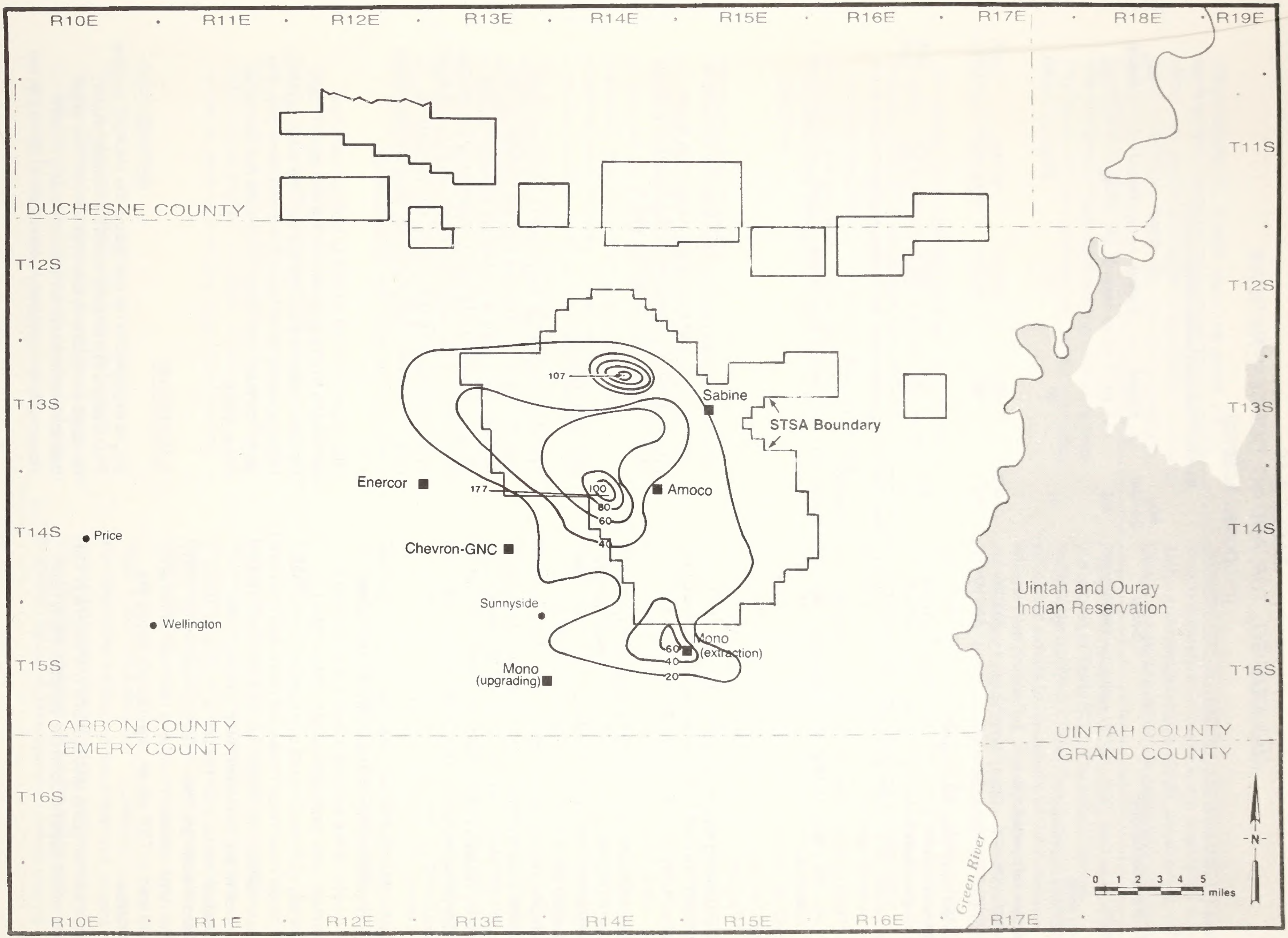
Total Suspended Particulates

Table 3-18 lists the proposed actions collective and cumulative concentration values at the receptors showing the highest concentration. These values are compared to the secondary NAAQS and year 2005 estimated background levels. The maximum receptor impacts are very similar for collective and cumulative impacts due to the dominance of a few sources. Maps 3-6 and 3-7 show the expected annual average concentrations of TSP and NO_2, respectively, for the cumulative analysis. Slight increases in the overall concentrations above the collective totals can be observed. However, the maximum receptor concentrations are essentially equal.

Map 3-6 does not include the estimated background concentrations of 20 $\mu g/m^3$. Therefore, the isopleth representing 40 $\mu g/m^3$ indicates the area expected to exceed the TSP NAAQS (60 $\mu g/m^3$). An area



MAP 3-6 CUMULATIVE ANNUAL TSP CONCENTRATIONS (ug/m³)
(Proposed Actions)



MAP 3-7 CUMULATIVE ANNUAL NO_2 CONCENTRATIONS (ug/m^3)
(Proposed Actions)

TABLE 3-18
MAXIMUM SO_2, TSP, AND NO_2 CONCENTRATIONS
(Proposed Actions)

	Maximum Average Concentrations ($\mu g/m^3$)					
	SO_2			TSP		NO_2
Areas of Special Concern	3-hour	24-hour	Annual	24-hour	Annual	Annual
NAAQS	1,300	365	80	150	60	100
Class II Areas						
PSD Class II Increment	512	91	20	37	19	NA
Areas Near Sunnyside STSA						
Collective Impacts	612(18)	170(7)	15(1)	723(84)	181(24)	128(2)
Cumulative Impacts	612(18)	170(7)	18(1)	723(84)	181(24)	177(2)
Uintah and Ouray Indian Reservation						
Collective Impacts	12(18)	3(7)	<1(1)	<1(84)	<1(24)	2(2)
Cumulative Impacts	14(18)	4(7)	<1(1)	<1(84)	<1(24)	2(2)

Note: Selection of a different grid origin could result in slightly different maximum concentrations and locations of those maximum due to the terrain variability.

Figures in parentheses represent 2005 Baseline Source Concentrations.

NA = not applicable; NO_2 = nitrogen dioxide; SO_2 = sulfur dioxide; TSP = total suspended particulates; $\mu g/m^3$ = micrograms per cubic meter

encompassing both Price and Wellington is expected to exceed the annual standard as well as an area within the Sunnyside STSA.

The current emission inventory provided by the State of Utah demonstrates that dirt roads are the dominant man-made emission source within Price and other cities and towns. If the emission inventories are generally correct, then dirt road emissions are the most significant source of the higher TSP levels. Naturally occurring blowing dust probably causes occasional high TSP levels, but not the pervasive long-term high levels monitored in the towns.

Outside cities and towns, the applicants' proposed tar sand developments would significantly affect TSP levels. Some surface mines are estimated to potentially emit more particulate matter than the entire city of Price. It is not unexpected, then, that TSP levels near those mines are predicted to exceed the standards. The Amoco surface mine and related activities would potentially emit 5 times more particulate matter than the city of Price and about the same as all sources in Carbon County for 1981. These large emissions within a relatively small area would lead to TSP values significantly above the standards.

Spatial and temporal distributions of these high TSP levels would depend upon the specific mine, haul road, and access road geometry as the tar sand is removed during the life of the mine. High levels probably would remain within the Sunnyside STSA during the majority of mining years.

Nitrogen Dioxide

The expected annual average NO_2 concentrations shown in Map 3-7 indicate that the NAAQS for NO_2 could be exceeded at 2 receptor grid points. One receptor would be affected principally by the Amoco plant stack gases, while the other would be affected by the Amoco mining activities. On-site data or refined modeling may show that the predicted levels are higher than what may actually occur.

NO_2 impacts would be due to both ground-level emissions from equipment at the mines and from elevated release from the stacks. The stack gas NO_2 impacts would be very localized and could prove to be overpredicted through local wind monitoring or tracer tests.

Sulfur Dioxide

SO_2 is expected to be well below the NAAQS, but the PSD Class II increments could be violated due to elevated emissions in complex terrain. The areas that are estimated to be above the SO_2 Class II increments are generally within 2 km (1.25 mi) of the

proposed plants. In each case, the winds would have to carry the plume toward the higher elevations under very stable atmospheric conditions in order to produce impacts. No on-site data are available to confirm this assumption. General drainage flow would tend to carry the plumes away from the affected terrain. Refined modeling or on-site data may show that the predicted SO_2 levels are higher than in actuality.

Carbon Monoxide

CO impacts were modeled only for the cumulative impacts of the proposed actions and the interrelated projects. The CO impact potential was determined to be very low. The predicted 1-hour and 8-hour maximum concentration values of 1,500 $\mu g/m^3$ and 900 $\mu g/m^3$ are below the 1-hour and 8-hour standards of 40,000 $\mu g/m^3$ and 10,000 $\mu g/m^3$, respectively.

Photochemical Products

The photochemical reactions of emissions of reactive non-methane hydrocarbons and nitrogen oxides (NO_x) is a potential air quality concern because of the production of photochemical oxidants (mainly ozone). The impact of emissions from the proposed actions and interrelated projects was analyzed by means of Version II of the Reactive Plume Model (RPM-II). Two trajectories were selected in the analysis, one traveling east toward Colorado, and the other traveling southeast toward Arches National Park. (Refer to **Air Quality Analysis for the Combined Hydrocarbon EIS, Eastern and South-Central Utah-Sunnyside STSA** (Aerocomp Inc. 1983) for methodology details.)

As shown on Table 3-19, for all areas of interest, the impact from the Sunnyside STSA would not exceed the ozone standard of 0.12 parts per million (ppm) (235 $\mu g/m^3$). It should be noted that the results are conservative (higher), because all Sunnyside emissions were treated as a single point source.

Acid Deposition

There is no current Environmental Protection Agency (EPA)-recommended guideline or procedure for determining potential impacts of acid deposition to sensitive ecosystems. It has been widely accepted that SO_2 and NO_x are the major precursors to acid deposition; therefore, the deposition fluxes of sulfur and nitrogen compounds, especially in PSD Class I areas, should be the parameters of concern.

Deposition velocities of NO_x, SO_2, and sulfate (SO_4) are shown in Table 3-20. The results for the cumulative analysis of acid deposition impacts, which are similar to the results of the collective analysis are presented. The dry deposition velocities are obtained from Schmel (1980), and Garland (1976). The wet deposition velocities are estimated using precipitation statistics (SA1 1983). (Refer to **Air Quality Analysis for the Combined Hydrocarbon EIS, Eastern and South-Central Utah-Sunnyside STSA** (Aerocomp Inc. 1983) for methodology details.)

Table 3-21 presents the results of the acid deposition analysis for areas of interest. In a submitted testimony before the Colorado Air Quality Control Commission, the Environmental Defense Fund (Oppenheimer 1982) suggested that sulfur deposition rates below 0.5 grams per square meter per year (g/m^2-yr) would not lead to acidification of sensitive lakes. Based on the existing sulfur deposition values from monitoring sites in the mountain regions, the background sulfur deposition flux is 0.28 g/m^2-yr. Consequently, additional sulfur deposition flux below 0.22 g/m^2-yr would suggest that sensitive ecosystems may not be affected (Dietrich et al. 1983). The results in Table 3-21 show that the acidic sulfur deposition impacts resulting from Sunnyside tar sand development may be insignificant. A similar "safe" threshold for nitrogen has not yet been established. However, comparing modeled results with those of other studies (Dietrich et al. 1983) suggests that, except in the Uintah and Ouray Indian Reservation, nitrogen depositions in the analysis area would be at background values.

Visibility

Currently, the judgment of adverse visibility impairment in Class I areas is subjective and determined on a case-by-case basis. In this study, the widely-used EPA levels 1 and 2 screening criteria were adopted.

Table 3-22 shows the level 1 screening results for the cumulative impacts of the applicants proposed tar sand developments and the interrelated projects. The collective impacts of just the applicants' proposed tar sand developments (which can be

TABLE 3-19
MAXIMUM PHOTOCHEMICAL PRODUCTS CONCENTRATIONS
(Proposed Actions)

Areas of Special Concern	O_3 (ppm)	NO_x (ppm)	PAN (ppm)	Aerosol ($\mu g/m^3$)
Maximum Concentration	0.11	0.042	0.0078	1.4
Uintah and Ouray Indian Reservation	0.10	0.0064	0.0063	1.2
Arches National Park	0.10	0.0025	0.0056	1.4
Colorado Border	0.09	0.0025	0.0049	1.4

Note: Results based on Version II of the Reactive Plume Model.
NO_x = nitrogen oxides; O_3 = ozone; PAN = peroxy acyl nitrates; ppm = parts per million; $\mu g/m^3$ = micrograms per cubic meter.

TABLE 3-20
WET AND DRY DEPOSITION VELOCITIES FOR SO_2, SO_4, and NO_x

Pollutants	Dry Deposition Velocity (cm/s)	Wet Deposition Velocity (cm/s)
Sulfur Dioxide	0.8	1
Sulfate	0.2	1
Nitrogen Oxides	0.8	1

cm/s = centimeters per second; NO_x = nitrogen oxides; SO_2 = sulfur dioxide; SO_4 = sulfate.

TABLE 3-21
ACID DEPOSITION ESTIMATES AT VARIOUS AREAS OF INTEREST
(Proposed Actions)

	Cumulative[a] Annual Deposition Flux (g/m^2-yr)	
Areas of Interest	Sulfur	Nitrogen
Uintah and Ouray Indian Reservation	0.1	0.8
Dinosaur National Monument	0.002	0.02
Arches National Park	0.005	0.04
Canyonlands National Park	0.001	0.01
Capitol Reef National Park	0.0004	0.003

Note: Results based on Mesopuff modeling.
g/m^2-yr = grams per square meter per year
[a]Represents cumulative impacts of the applicants' proposed tar sand development plus the interrelated projects.

TABLE 3-22
LEVEL 1 VISIBILITY ANALYSIS
(Proposed Actions)

Observer Point Location	C1 Plume Contrast Against Sky	C2 Plume Contrast Against Dark Terrain	C3 Region Reduction Sky/ Terrain Contrast
Panorama Point Arches National Park	0.126	0.321	0.073
Cathedral Valley Overlook Capitol Reef National Park	0.106	0.231	0.073
Murray Point Overlook Canyonlands National Park	0.111	0.256	0.073
Moonshine Rapids Dinosaur National Monument	0.118	0.283	0.073
Buck Knoll Uintah and Ouray Indian Reservation	0.175	0.604	0.073
Peters Point Uintah and Ouray Indian Reservation	0.190	0.712	0.073
EPA Recommended Guidelines	0.100	0.100	0.100

Note: Results presented are the cumulative impacts of the applicants' proposed tar sand development plus the interrelated projects.

seen in the **Air Quality Analysis for the Combined Hydrocarbon EIS, Eastern and South-Central Utah-Sunnyside STSA** (Aerocomp Inc. 1983)) would be very similar. C1 and C2 fail for all observer points analyzed; that is, plume discoloration is perceptible regardless of the viewing background (dark terrain or blue sky). The SO_2 emissions are not sufficient to perceptibly contribute to regional haze (C3 passes level 1 screening).

The level 2 visibility results are summarized in Table 3-23. As noted, there would be no perceptible visibility impairment at the three Class I areas and Dinosaur National Monument. At Peter's Point and Buck Knoll of the Uintah and Ouray Indian Reservation, the plume could be perceptible against the sky due to the NO_x emissions associated with the proposed developments. Although at Buck Knoll particulate emissions could contribute to perceptible contrast and visual range reductions, it must be emphasized that the estimates given in Table 3-23 are conservative (high). The analysis assumed that all emissions within the STSA, including those from ground level sources, were combined to form a single plume.

TABLE 3-23
LEVEL 2 VISIBILITY ANALYSIS
(Proposed Actions)

Observer Point Location	Contrast Reduction	Visual Range Reduction	Blue-Red Ratio
Panorama Point Arches National Park	0.039	3.8	0.98
Cathedral Valley Overlook Capitol Reef National Park	0.041	4.0	0.98
Murray Point Overlook Canyonlands National Park	0.044	4.3	0.94
Moonshine Rapids Dinosaur National Monument	0.032	3.0	0.93
Buck Knoll Uintah and Ouray Indian Reservation	0.097	10.6	0.70
Peters Point Uintah and Ouray Indian Reservation	0.041	3.9	0.69
EPA Recommended Guidelines	0.100	11.0	0.90

Note: Results presented are the cumulative impacts of the applicants' proposed tar sand development plus the interrelated projects. The recommended criteria has to be exceeded for impacts to contrast and visual range reduction. Visual impacts occur for blue/red less than 0.9.

3.A.8 TRANSPORTATION NETWORKS

Impact Significance Criteria

Impacts to transportation were considered significant if the roadway volume-to-capacity relationship on project-related roadways would result in the traffic operating level-of-service falling below a stable flow condition. Based on Utah Department of Transportation (UDOT) standards foı low density population areas, a level of Service B was used as the desired operation standard; level-of-service C was used for high density population areas. Transportation impacts were also considered significant if the vehicle miles of travel (VMT) increase generated by the proposed actions would increase the number of vehicle traffic accidents. Impacts as a result of the rail gross tonnage per year were considered significant if the tonnage increase would result in vehicle travel delays of more than 5 minutes per hour. The addition of project-generated railroad tonnage was considered significant if the tonnage would exceed the operating capacity of the Denver and Rio Grande Western (D&RGW) railroad spur between Mound and Sunnyside, Utah.

Roadway Systems

The vehicular traffic and roadways that are associated with the Sunnyside STSA are located primarily within the counties of Carbon, Emery, and Duchesne (Map 1-3, Section 1.A.5).

Primary Roads Providing Access to the STSA

The majority of the the vehicular traffic can enter the STSA only 2 ways—from the southwest corner

through the town of Sunnyside and from the north side using Nine Mile Canyon. This is due to the geographic constraints. The area within and adjacent to the STSA has very rough terrain and the Green River forms a natural barrier outside the STSA on the east side.

Traffic Flow Analysis

The capacity of a roadway system is a measure of its ability to accommodate traffic and is a function of physics and geometric parameters, such as number of lanes, lane width, grade, auto-truck vehicle mix, and operating speeds. The peak year associated with collective and cumulative construction and operation periods were selected for evaluation impacts. Capacity analysis was completed for annual average monthly traffic (AAMT).

Impacts

Under the maximum peak demand conditions for the projected peak years of 1989 and 2003, collectively, 8 of the 16 road segments of the project area are operating below the level-of-service; cumulatively, 12 of the 16 road segments are below level-of-service C. This is based on service values for level-of-service C and computed from standards from the American Association of State Highways and transportation officials and used by the UDOT as a design standard for rural minor arterial and major collectors. According to the UDOT, the 1982 existing traffic and the road facilities serving the project area are generally in a stable flow condition. The project traffic associated with the proposed actions would cause a downgrading of the level-of-service in a majority of the road segments within the project area.

The projected baseline estimates, vehicle trips per day (VTPD), total peak demand, percentage increase over the projected baseline, and level-of-service for the collective and cumulative peak construction operation overlap years and the operation years are shown on Table 3-24. The table also includes 16 specific roadway segments located on US 6 between Green River and Helper, on SR 123 between the US 6 junction and Sunnyside, and on SR 10 between Price and Castle Dale and identifies those segments that would have impacts.

The collective impacts for the peak year 1989 would add a total of 10,250 VTPD associated with the proposed actions' construction-operation overlap year. This would cause a short-term impact by lowering the level-of-service below C between the years 1988 and 1991 on specific roadway segments within the conversion area. Peak year 2003 would add a total of 10,460 VTPD to the proposed actions operation period. This primarily would be due to the lowering of UTOD's level-of-service C, a preferred maximum traffic volume for rural arterial and collector roadways. Table 3-24 identifies specific segments (7 in 1989 and 8 in 2003) where the level-of-service would be below C, which are the segments that would have significant traffic volume impacts. These segments are shown on Map 1-3 (Section 1.A.5).

The major transportation arteries that service the STSA are U.S.(US) Highway 6, State Road (SR) 10, SR 123, and Carbon County 381. US 6 is a 2- and 4-lane, paved highway that connects with Interstate 70 (I-70) 4 miles west of the town of Green River and runs northwest through Wellington, Price, Helper and on to Salt Lake City. SR 10 is a 2-lane paved road that leaves Price and runs southwest; it services the towns of Huntington, Cleveland, Elmo, Orangeville, and Castle Dale.

SR 123 and Carbon County 381 serve as major collectors to handle the traffic in and out of the STSA, off US 6. SR 123, a 2-lane paved road, leaves US 6, 7 miles east of Wellington and goes to Sunnyside where it continues as 6522, an unpaved Carbon County road. It connects with a variety of packed soil and gravel roads within the main block of the STSA that are administered and maintained by the BLM, Carbon County, and private landowners. Carbon County 381, a paved road for only 12 miles, leaves US 6 at Wellington and loops the west and the north side of the STSA and intersects 3 unpaved BLM roads (6514, 6519 and 6559) to provide direct access to the north side of the STSA through Nine Mile Canyon. These roads also allow STSA traffic to flow south to Sunnyside.

Secondary Roads Providing Access Within the STSA

The existing road system on public lands within the STSA is administered under a December 1980

Memorandum of Understanding between the BLM and Carbon County. In this memorandum, the BLM and Carbon County have agreed to construct and maintain roads to meet multiple-use responsibilities and construct and maintain various county road access to public lands in Carbon County. Various private roads within the STSA are maintained and controlled by the private sector. Private ownership limits access to many miles of road and locations throughout the STSA. The applicants' leases could prevent public access to public lands and ranches, due to the cost of reconstructing new access roads outside the lease area. Map 3-5 (map pocket) shows the location of the road system within the STSA.

The UDOT is responsible for monitoring the weight of loads being transported on Utah state highways. Vehicle loads in excess of state size and weight limitations are required to obtain a special permit from the UDOT. The maximum weight that can be transported on Utah highways is a function of the number and spacing of vehicle axles and the nature of the load being transported. Vehicle weights in excess of allowable Utah limits require individual review by the UDOT to determine the structural capacity of the ridges and culverts to handle the loadings.

The roads within the STSA range in width from 8 to 20 feet and have surfaces ranging from packed soil to gravel. Road use is limited to pickups or vehicles with high clearance, or four-wheel-drives. The roads have been developed based on needs of mineral development, recreation vehicles, and livestock grazing. Vehicle accessibility is restricted in the upper elevations within the STSA for a period, generally from November to May, due to heavy snowfall.

The cumulative traffic volume impacts for the peak years 1989 and 2003 associated with the developing of 20 coal mines and the Chevron 10,000 bpd processing plant would add 19,746 VTPD to the roadway system during the construction-operation overlap period and 20,072 VTPD during the operation period. Impacts would occur on US 6, SR 10, and SR 123 and extend to additional specific roadway segments on SR 10 between Price and Castle Dale. Table 3-24 identifies specific segments (10 in 1989 and 13 in 2003) that would have significant long-term impacts. The impacts are directly related to lowering the level-of-service below C.

The vehicle accident rate per million vehicle miles traveled (MVMT) on US 6 between Soldier Summit and Green River for 1982 was 1.22 accidents per million vehicle miles, which is below the State of Utah's expected rate of 2.06 accidents per MVMT for roads similar to US 6. On SR 123 between the US 6 junction and Sunnyside, the rate for 1982 was 0.75 accidents per MVMT which also is below the expected rate of 2.88 accidents per MVMT. On SR 10, between Price and Castle Dale, the 1982 accident rate per MVMT was 1.29, which is below the expected rate of 2.02. The traffic accidents per MVMT traveled in 1982 on US 6 between Soldier Summit and Green River was 166; on SR 123 between the US 6 junction and Sunnyside, it was 6; and on SR 10 between Price and Castle Dale, it was 64.

Collectively, in the year 1989, the construction-operation overlap year, traffic volume would add a total of 10,250 VTPD to US 6, SR 10, and SR 123; in 2003 the collective operations would add 10,460 VTPD. The additional traffic volume would lower the level-of-service for specific segments of the road system. Table 3-24 identifies those segments of road where the level-of-service would be lower than C, which are the segments where additional traffic accidents would occur.

Information from the UDOT Division of Traffic Safety indicates that the traffic accident rates would not significantly increase; however, traffic accidents would be expected to increase in proportion to the increase in traffic volume. Collectively, in 1989 (the construction-operation overlap year) the 195 percent increase in VTPD would cause about 156 additional traffic accidents. Collectively, in 2003 (the operation year) a 201 percent increased in VTPD would cause 161 additional traffic accidents. This increase in traffic accidents would be a significant long-term impact to the health and safety of the travelers.

Cumulatively, in the peak years 1989 and 2003 the interrelated projects would add traffic volume totaling 19,746 and 20,072 VTPD, respectively. The additional traffic would lower the level-of-service below Band C for specific segments of the road system (Table 3-24). SR 10 between Price and Castle Dale would be most affected by the cumulative traffic volume increase. UDOT indicated that the traffic accident rate would not significantly increase, but the traffic accidents would be expected

to increase in proportion to the increase in the volume of traffic. Cumulatively, in 1989 a 469 percent increase in VTPD would cause about 375 additional traffic accidents. Cumulatively, in 2003 (the operation period) a 478 percent increase in VTPD would cause 382 traffic accidents. This increase of traffic accidents would be a significant impact to the health and safety of the traveler.

TABLE 3-24
PROJECTED HIGHWAY ANNUAL AVERAGE MONTHLY TRAFFIC
(Proposed Actions)

			COLLECTIVE IMPACTS											
			Construction-Operation Overlap Impacts						Operation Impacts					
Road Segment	Traffic Control Point Location[a]	1989 Level-of-Service Baseline[c]	Projected 1989 Baseline Estimate (VTPD)[b]	1989 Applicant-Related Increase (VTPD)	Total Peak (VTPD)	Percent Increase Over Projected Baseline	Level-of-Service Projected Baseline[c]	2003 Level-of-Service Baseline[c]	Projected 2003 Baseline Estimate (VTPD)[a]	2003 Applicant Related Increase (VTPD)	Total Peak VTPD	Percent Increase Projected Baseline	Level-of-Service Projected Baseline[c]
US 6													
Junction SR J39	1	C	12,653	620	13,473	6	C	C	14,690	940	15,630	6	C
FAS 298 (old road) SR 55 West of Price	2	B	6,164	1,620	9,784	19	C	B	9,476	1,500	10,978	16	C
Bypass Road S of Price	3	B	9,421	6,315	15,738	67	C	B	10,936	5,565	16,501	50	C
West incl. Wellington	4	B	6,676	6,315	13,191	91	E	C	7,962	5,565	13,547	70	E
East incl. Wellington	5	B	4,683	7,350	12,033	157	E	B	5,437	7,575	13,012	139	E
Woodside-FAI 70 West of Green River	6	B	2,545	330	2,875	12	B	B	2,994	180	3,174	6	B
SR 123													
Junction US 6	7	B	2,718	7,680	10,398	283	E	B	3,155	7,755	10,910	246	E
Junction SR 124	8	C	4,034	9,580	13,614	237	F	C	4,383	9,890	14,273	228	F
South incl. Sunnyside-North incl. Sunnyside	9	B	2,015	10,250	12,285	509	E	B	2,338	10,460	12,798	447	E
SR 10													
East incl. Castle Dale	10	C	3,439	300	3,739	9	C	C	3,993	270	4,283	7	C
Junction SR 29	11	D	5,305	300	5,605	5	C	D	6,159	270	6,429	4	D
South incl. Huntington	12	D	6,860	525	7,385	7	D	D	7,894	450	8,344	8	E
Junction SR 155 Road to Elmo	13	C	3,883	795	4,678	20	C	C	4,508	675	5,183	17	C
Carbon/Emery County Line	14	C	3,883	810	4,693	21	C	C	4,508	680	5,188	15	C
Junction SR 122	15	C	4,034	835	4,868	21	C	C	4,684	695	5,679	15	C
Price South incl. Price	16	D	6,712	850	7,562	13	D	D	7,759	720	8,469	9	E

TABLE 3-24 (Concluded)
PROJECTED HIGHWAY ANNUAL AVERAGE MONTHLY TRAFFIC
(Proposed Actions)

	CUMULATIVE IMPACTS													
	Construction-Operation Overlap Impacts								Operation Impacts					
Road Segment	Traffic Control Point Location[a]	1989 Level-of-Service Baseline[c]	Projected 1989 Baseline Estimate (VTPD)[b]	1989 Applicant-Related Increase (VTPD)	Total Peak (VTPD)	Percent Increase Over Projected Baseline	2003 Level-of-Service Projected Baseline[c]	Projected Level-of-Service Baseline[c]	2003 Baseline Estimate (VTPD)[a]	2003 Applicant Related Increase (VTPD)	Total Peak VTPD	Percent Increase Projected Baseline	Level-of-Service Projected Baseline[c]
US 6													
Junction SR J39	1	C	12,653	1,725	14,378	13	C	C	14,690	1,720	16,410	12	C
FAS 298 (old road) SR 55 West of Price	2	B	8,164	3,620	11,784	44	C	B	9,478	3,750	13,228	40	C
Bypass Road S of Price	3	B	9,421	14,035	23,456	148	C	B	10,938	9,860	20,796	90	C
West Incl. Wellington	4	B	6,876	9,570	16,446	139	E	C	7,982	9,010	18,992	113	E
East Incl. Wellington	5	B	4,683	8,410	13,093	180	E	B	5,437	9,480	14,917	174	E
Woodside-FAI 70 West of Green River	6	B	2,545	385	2,930	15	B	B	2,994	225	3,219	8	B
SR 123													
Junction US 6	7	B	2,718	8,640	11,358	318	E	B	3,155	8,570	11,925	278	E
Junction SR 124	8	C	4,034	9,840	13,874	244	F	C	4,383	10,100	14,483	230	F
South Incl. Sunnyside-North Incl. Sunnyside	9	B	2,015	10,500	12,515	521	E	B	2,338	10,460	12,798	447	E
SR 10													
East Incl. Castle Dale	10	C	3,439	990	4,429	29	C	C	3,993	1,100	6,093	28	C
Junction SR 29	11	D	5,305	990	8,295	19	C	D	8,159	1,100	7,259	18	D
South Incl. Huntington	12	D	6,860	1,435	8,295	21	D	D	7,894	1,560	9,454	20	E
Junction SR 155 Road to Elmo	13	C	3,883	2,030	5,913	52	C	C	4,508	2,200	6,708	49	C
Carbon/Emery County Line	14	C	3,883	2,055	5,938	53	C	C	4,508	2,240	8,748	50	C
Junction SR 122	15	C	4,034	2,090	8,124	52	C	C	4,684	2,285	8,969	49	C
Price South Incl. Price	18	D	6,712	2,120	8,332	33	D	D	7,759	2,325	10,084	30	E

Note: VTPD = vehicle trips per day; Incl. = including.

[a]Refers to locations shown on Map 1-3.

[b]Projected 1981 highway traffic volume for US 6, SR 123 and SR 10 by one percent compounded.

[c]American Association State Highway and Transportation (1965) Levels-of-Service. A=free traffic flow, accompanied by low volumes and high speeds; B=stable traffic flow, with operating speeds beginning to be restricted by traffic conditions; C=stable traffic flow, but drivers are restricted in their freedom to select speed, change lanes, or pass; D=approaches unstable traffic flow, with fluctuations in volume and temporary restrictions to flow, which may cause substantial drops in operating speeds; E=unstable traffic flow, with momentary stoppages; F=forced traffic flow, with low speeds and short or long stoppages because of downstream congestion. Level-of-Service = Baseline x factor (Volume Per Hour) - factor (Volume Capacity Ratio and calculated on a highway speed of 60 mph under uninterrupted flow conditions).

Railroad System

The D&RGW, a class I railroad, services the area of influence with a spur leaving the mainline at Mounds and terminating at Sunnyside. The Carbon County Railroad, a class II railroad, uses the D&RGW spur to Sunnyside and its own track south of Sunnyside to the Kaiser Coal Mine. The Sunnyside spur and the Carbon County Railroad are primarily used by unit coal trains.

The D&RGW mainline connects Salt Lake City with Denver, Colorado, and has 25 to 30 trains per day. This is approximately 25 percent of the estimated 100 to 125 trains per day capacity of the line. The 17.5-mile spur from Mounds to Sunnyside presently carries approximately 3.6 million gross tons per year and has a carrying capacity of 5 million gross tons per year. Due to the closure of the US Steel Coal Mine and the reduction in Kaiser Coal Mine production, future tonnage on the spur would drop well below 2.1 million gross tons per year. At the present, the only siding within Sunnyside is owned by US Steel.

Collectively, the material and equipment needed to construct the 5 processing plants proposed by the applicants could exceed 3 million gross tons for the peak construction year, 1989. The addition of 3 million gross tons could cause a significant short-term impact to the D&RGW spur, because it would cause the estimated 5-million-gross-tons-per-year capacity of the line to be exceeded. The processing plants would be constructed from modules that would be hauled by rail to the Sunnyside area and trucked to the plant sites. This could generate oversize loads that would require special handling by the D&RGW railroad. The impact of these oversize loads could be insignificant.

Collectively, the 5 proposed processing plants would produce 115,000 bpd of synfuel during full commercial operation. Based on the applicants' plans of operations, the synfuel could be transported from the plants by truck, rail, and/or pipeline. Hauling large volumes of synfuel by truck was considered to be impractical. For example, to haul 57,500 bpd (half of the proposed production) would require 302 trucks per day (one-way) carrying 8,000 gallons per load, each with a weight of 30 tons. Therefore, for analysis purposes, it was assumed that during commercial operation, synfuel would be transported by rail and, later, pipeline.

Estimating the worst case, it was assumed that half of the proposed 115,000 bpd, or 57,500 bpd would be shipped by rail from Sunnyside. This volume of synfuel corresponds to approximately 3.3 million gross tons per year. When added to the estimated 2.11 million gross tons per year of baseline capacity, this volume would slightly exceed the 5 million gross ton capacity of the D&RGW railroad spur. Transporting 57,500 bpd could require loading 105 85-ton railroad tank cars in a 24-hour period. This would total 2.4 unit trains (84 cars/train) or 205 cars per day in and out of the East Carbon/Sunnyside area. This would have a significant long-term tonnage capacity impact to the rail spur.

There could be an additional significant long-term land use impact, due to utilizing land adjacent to the D&RGW spur within the East Carbon/Sunnyside area to construct speed-loading facilities and a rail car storage yard for a maximum of 2.5 unit trains or 210 tank cars at one time.

As production approaches the full commercial level of 115,000 bpd, it could be more economical to ship the synfuel by pipeline, which has been suggested by the applicants. Using a pipeline to transport synfuel, when full production levels are reached, could cause a significant financial impact to the railroad, due to (1) the reduction in tonnage; and (2) the abandonment of the speed-loading facilities and the rail storage siding tracks that were constructed to meet the needs of the developing tar sand industry.

The interrelated projects also would affect the Sunnyside D&RGW railroad spur during the operation peak year 1995. This would have a significant long-term cumulative impact. The total rail tonnage for the coal mines is estimated to be 7.2 million gross tons per year by 1990, which alone would exceed the existing capacity of the rail spur. Cumulative tonnage also would add to the congestion impact of the rail storage year in the East Carbon/Sunnyside area.

Public Transportation Systems

Two Public airports service the area of influence. The Carbon County Municipal Airport is located 4 miles from Price and has 3 paved runways—3,640 foot, 4,520 foot and a 5,700 foot (being expanded to a 7,300 foot). The airport at Green River, which will move to a new location by late summer 1983, will have a 5,000 foot paved runway. Neither airport has commercial flights; chartered service is available. The airports are operated only during the day.

The increased demand for service associated with the predicted project-related population increases could have a significant, long-term impact on the airports. Population increases in 1989 (46,400 people) and in 2005 (63,200 people) are projected. The increased demand could be sufficient to support the establishment of commercial flights to the local airports.

Passenger rail service is provided by Amtrack. Two trains per day (one east and one west) stop at Helper. Bus service is provided by Trailways. Three buses per day travel US 6 and stop at Green River, Wellington, Price and Helper, and on to Salt Lake City. There is no bus service to East Carbon City, Sunnyside or on SR 10 to Castle Dale.

Collectively, the population increases associated with the applicants' proposed projects would not cause significant impacts to passenger rail service or bus service. Cumulatively, population increases associated with the proposed projects and interrelated projects would not cause significant impacts to the passenger rail service or bus service along Route US 6; however, the increases could provide the impetus to establish service on SR 10 to the towns of Huntington, Cleveland, Elmo, Orangeville, and Castle Dale, and establish service on SR 123 to the towns of East Carbon and Sunnyside.

Summary

Based on analysis of the road system and the impact significance criteria, it is predicted that, due to project-related traffic volume increases, significant transportation-related impacts (lowering the level-of-service below C would be generated collectively by the applicants' proposed projects during 1989 (the peak construction-operation overlap year), and during 2003 (the peak operating year). Both collectively and cumulatively, the significant impacts would occur on US 6 between the SR 123 junction and the town of Helper; on SR 123 between the US 6 junction and Sunnyside; and on SR 10 between Price and Castle Dale.

Due to the project-related rail tonnage volume increase, significant collective and cumulative impacts would be generated, because the tonnage volume would exceed the 5 million gross ton capacity of the rail spur. The collective impacts would start in 1989, with the peak operation year being 2003.

The cumulative impacts, caused by tonnage exceeding the 5 million gross tons per year of the D&GRW spur, would start in 1989 and continue through the peak operation year (1995) for the life of the coal mines and the 10,000 barrels per day (bpd) Chevron processing plant located in the East Carbon/Sunnyside area. The collective and cumulative rail significant impacts would only affect the D&RGW rail spur from Mounds to Sunnyside.

Due to project-related traffic volume increases, there would be a significant road maintenance impact even though the level-of-service would not change.

The fact that some of the loaded trucks could weigh in the range from 90,000 to 200,000 pounds and lengths from 25 to 102 feet would require new roadway construction, and realignment and upgrading of all the roads used by the applicants within the STSA would be needed. The large and heavy trucks, in most cases, would be using the roads within the STSA. If, however, trucks would be required to use the public roads, the proper special use permits would have to be obtained from UDOT. This would have significant collective impacts on the visual resources, and land disturbance associated with the secondary road system within the STSA during both construction and operation periods. These impacts would begin in 1986, 2 years prior to construction of the plant sites, because roads have to be built prior to plant construction.

3.A.9 AGRICULTURE

Impact Significance Criteria

The grazing and cropland impact significance criteria are based on professional experience gained from various agricultural areas and on the total acreage and type of cropland within the proposed conversion areas and surrounding areas.

Impacts to livestock grazing are considered significant if the amount of forage lost would reduce livestock stocking rates by 5 percent or more in affected pastures or allotments. Impact to an allotment is considered significant when the amount of forage lost to grazing within the allotment would exceed 10 percent (BLM 1983).

Impacts to cropland are considered significant if more than 5 acres of land would be irreversibly converted to other uses or if the viability of any of the land would be significantly diminished by a project, or if cropland outside of a conversion area would be affected to the extent that more than 5 percent of the total cropland of the area would be irreversibly converted to other uses because of project development.

Livestock Grazing

Livestock grazing and forage availability (carrying capacity) information presented in this EIS was gathered from interpretations of a third-order soil survey (Soil Conservation Service (SCS) and BLM 1981), **the Price River Grazing Management Draft Environmental Impact Statement** (BLM 1982a), and the **Range Creek Management Framework Plan** (BLM 1982b).

Livestock grazing is authorized on state and federal lands where the proposed conversions are located. The BLM has established grazing allotments that are legal parcels of land for which grazing privileges are authorized. These allotments also include lands administered by the State of Utah and private ownership. Allotment boundaries were determined by the location of permittees, private lands, qualified demand, and customary area of use. Presently 24 ranchers are allowed to graze livestock on 12 allotments within the area of influence (Map 3-2, map pocket). Grazing allotments that would be affected by the proposed actions and alternatives are listed in Table 3-25. Most of the operations are cow-calf or cow-calf-yearling operations. Currently, none of the permittees graze sheep on public lands within the area of concern.

Grazing capacities vary widely in the area due to vegetation types (range sites), land form, slope, and range condition. Not all lands within the area are suitable for livestock grazing. Areas with slopes over 50 percent are generally not suitable. Grazing capacities range from 9 to 61 acres per animal unit month (AUM). The lower capacity areas occur in the droughty lowlands and south-facing steep mountain slopes in the drier climatic zone; the higher capacity areas occur where the average annual precipitation is more favorable and in higher elevations on smoother slopes.

Based on the impact analysis and the grazing impact significance criteria, significant impacts to forage would occur. Forage production would be significantly affected by the land disturbance associated with mining the proposed conversion areas. Collectively, the applicants' proposed tar sand developments would cause the loss of approximately 387 AUMs of forage per year, which equates to a reduction of 97 head of livestock (cattle), based on a 4-month grazing season. Cumulatively, the applicants' proposed development plus the interrelated projects would cause the loss of 409 AUMs of forage, which equates to a reduction of approximately 102 head of livestock (cattle).

The potential forage loss to grazing would result from disturbance associated with surface mining, in-situ recovery, spent sand disposal, and from areas of land being occupied by buildings and roads (Map 3-2, map pocket). Table 3-25 identifies the potential loss of AUMs by allotment, number of operators affected, and the number and percentage of each allotment affected. The applicants' proposed tar sand developments would affect 12 allotments, with disturbance to grazing occurring over a period of approximately 74 years.

Surface mining and spent sand disposal disturbance would cause the most significant impact to grazing. The total area would not be disturbed by surface mining or covered by spent sand in the early stages of the mining operation; however, due to the steep terrain and the spent sand placement process and associated traffic, the mining sequence would necessitate exclusion of livestock grazing or cause loss of forage production for grazing for longer periods of time (10 years or more). Disturbed land would be reclaimed at the same rate as mining progresses (with the exception of Amoco's mine where the pit would remain open for 20 years with an area of 3,000 acres unreclaimed) (refer to Figure 1-9 in Section 1.D.2, and Appendix A-7, Reclamation and Erosion Control Programs, for additional details). The total acreage that at any one time would be undergoing surface mining and spent sand disposal, and in various stages of reclamation and unable to support grazing, would be 6,500 acres (Table 3-25).

Development on proposed conversion areas would affect 24 ranch operators who own land and lease public land for grazing that is located within 12 allotments where surface mining, spent sand disposal areas, plant sites, and in-situ recovery would be located. Most of the grazing loss would be sustained by 12 ranch operators located within 7

allotments at various times during the active mining period. Refer to Table 3-25 for number of operators, allotments affected, and potential AUMs lost. The AUM losses in Cow Canyon, Sheep Canyon, Dry Canyon, and Patmos grazing allotments would be significant. The percentage of AUMs lost to grazing in these allotments would vary from 9 percent to 12 percent of total acreage of the allotment for the life of the proposed mining operations. The land use changes associated with introduction of a tar sand industry in the area ultimately would be at the expense of grazing, since grazing is the dominant present use in the area.

The degree of impact on each range operation would vary greatly due to location and size of individual holdings (owned and leased) in relation to the proposed development of lands. The magnitude

TABLE 3-25
GRAZING ALLOTMENTS AFFECTED AND GRAZING LOSSES CAUSED BY THE PROPOSED ACTIONS

	CURRENT STATUS				POTENTIAL GRAZING LOSSES (AUMs)[a]				
Allotment Name and Number	Number of Operators	Acreage Public	Acreage Total	Active Reference (AUMs)	Collective Total	Interrelated Projects Total	Cumulative Total	Percent of Allotment	Additional Notes
B Canyon (4006)	1	2,024	2,779	100 (20 Ac/AUM)	22 (3)	0 0	22 (3)	22 (3)	
Cow Canyon (4032)	4	2,145	—	71 (30 Ac/AUM)	54 (6)	0 0	54 (6)	78 (9)	
Dry Canyon (4038)	1	14,805	20,680	890 (17 Ac/AUM)	435 (114)	0 0	435 (113)	49 (13)	Significant impact to one operator
Green River North (4049)	1	122,845	166,621	8,584 (14 Ac/AUM)	502 (95)	0 0	502 (95)	6 (1)	
Mud Springs (4077)	1	21,836	27,859	2,320 (9 Ac/AUM)	108 (20)	0 0	108 (20)	10 (0.1)	
North Clarks Valley (4079)	1	8,240	14,981	293 (28 Ac/AUM)	11 (2)	0 0	11 (2)	4 (0.1)	
Pace Canyon (4085)	1	1,341	7,823	80 (17 Ac/AUM)	19 (2)	0 0	19 (2)	24 (3)	
Patmos (4087)	1	1,336	7,878	47 (28 Ac/AUM)	47 (6)	0 0	47 (6)	100 (12)	Significant impact to one operator
Range Creek (4096)	1	43,899	54,888	300 (43 Ac/AUM)	2 (2)	0 0	2 (2)	0.8 (0.8)	
Rock Canyon (4100)	1	978	2,664	16 (61 Ac/AUM)	4 (1)	0 0	4 (1)	25 (3)	
Sheep Canyon (4103)	7	9,170	18,302	696 (13 Ac/AUM)	531 (85)	0 0	531 (85)	76 (12)	
Stone Cabin (4109)	2	23,014	30,518	1,625 (14 Ac/AUM)	116 (26)	0 0	116 (26)	7 (2)	
Outside[b]	2	unknown	NA	-- (16 Ac/AUM)	208 (25)	112 (22)	320 (47)	NA NA	
Total AUMs Lost/Year					(387)	(22)	(409)		

Note: AUM = animal unit month; Ac/AUM = acres per animal unit month; NA = not applicable.

[a]Figures without parentheses represent forage production (AUMs) per year for the entire proposed conversion area or area affected. Figures enclosed by parenthesis represent average forage production (AUMs) lost per year due to mining activities based on a 5-year reclamation schedule (with exception of Amoco).

[b]Grazing parcels outside of named allotment boundaries.

of the impact also would vary with the rate and timing of development of the mining operations. Thus, the magnitude of the impact cannot be quantified.

Reclamation and revegetation of land disturbance is expected to be successful and would provide forage production for grazing when the proposed mining operations are completed. This expectation for successful reclamation is based on 3 assumptions: (1) implementation of the erosion control and reclamation programs outlined by the applicants; (2) compliance with site-specific erosion control and reclamation plans approved by federal and state authorizing agencies, and private landowners; and (3) compliance with requirements and stipulations of right-of-way grants and mineral leases for federal and state lands.

Disturbance associated with the in-situ recovery process proposed by Sabine would affect a total of 6,000 acres of vegetation over a period of 30 years, causing a short-term (2 to 5 years) loss of 1,000 acres at any one time.

Disturbance associated with construction of pipelines, power lines, and roads would cause a short-term loss of forage (2 to 5 years) on approximately 845 acres along a narrow, elongated area. The impact of this disturbance would be considered insignificant.

An additional undetermined number of AUMs would be lost, because grazing areas would become remote or inaccessible. This problem would arise through disruption of livestock water sources and facilities, disruptions of grazing patterns and grazing access to certain areas due to the surface mining, and disturbance of land by spent sand disposal areas. AUM loss cannot be quantified, because specific details on mining sequence and reclamation schedules are unknown at this time.

In addition to direct loss of livestock forage, other secondary impacts associated with population increases and traffic and mine development would occur. These impacts include: (1) disturbance of allotment boundaries and pasture fences resulting in livestock grazing control problems; (2) disturbance (molestation) of grazing animals by off-road vehicle users; (3) increased vandalism of fences and other range facilities; (4) increased livestock road kills; and (5) reduced palatability of forage adjacent to haul roads and other conveyance systems due to dust-covered vegetation.

Cropland

No cropland occurs within the main block of the STSA. However, approximately 16,617 acres of cropland occurs on the terraces and floodplains of the Price River and the larger tributaries streams and on the gently sloping plains in the vicinity of Wellington, Price, and Sunnyside, which are within the area that would be affected by urban expansion and development. Crop production in these areas is entirely dependent on irrigation due to the low annual precipitation (6 to 12 inches). Prime agricultural land occurs on the nearly level terrace and floodplains. Approximately 30 percent of the irrigated cropland is identified as prime agricultural land (SCS-BLM 1970; SCS 1979; State of Utah 1981).

The principal type of farming is the production of livestock feed. Alfalfa hay, the principal crop, is grown on approximately 70 percent of the cropland areas. Small grains (barley and oats), corn, and pasture and meadow hay are other crops grown (SCS-BLM 1970; SCS 1979).

No cropland would be affected by any of the plant site facilities, surface or in-situ resource recovery operations, or spent sand disposal. However, cropland losses are anticipated due to population expansion. Project-related population increases due to mining activities proposed by the applicants would cause the conversion of an estimated 2,826 acres of land to homesites and other related urban development in the areas of Price, Wellington, and Sunnyside (0.13 acres per capita, ERS 1970). Even though most land use conversion is predicted to occur in areas of existing subdivisions or in native rangeland areas, some areas of cropland would be affected. Approximately 933 acres of cropland, including prime agricultural land, along the Price River between Price and Sunnyside Junction (mainly in the vicinity of Wellington) would be converted to urban uses.

Based on the impact analysis and the cropland impact significance criteria, the conversion of cropland to urban uses due to mining activities by the 5 applicants associated with the proposed lease conversions would be significant to the cropland base within Carbon County.

3.A.10 CULTURAL RESOURCES

Impact Significance Criteria

Significant impacts to cultural resources would occur if the resources cannot be mitigated by recording and/or excavation or any other means and the resource is considered significant.

Prehistory

The Sunnyside STSA lies within the northern portion of the Colorado Plateau. The Colorado Plateau has been inhabited for approximately 12,000 years. Within this time span, population patterns have fluctuated according to environmental and socioeconomic constraints. These population patterns have been assigned by prehistorians to several culture periods: Paleo-Indian, Archaic, Fremont-Anasazi, and Shoshonean (BLM 1980b).

Most archaeological research in the area has been in Nine Mile Canyon, north of the main block of the STSA. (Morss 1931, 1954, Reagan 1933, Gillin 1955, and Gunnerson 1957). A portion of Nine Mile Canyon has a high density of archaeological resources. The canyon contains a variety of site types including rock art, dry masonry fortresses, pit houses, granaries, caves, and rockshelters. The district has the greatest known concentration of rock art sites from the Fremont culture period in the area. Five sites have been excavated in Nine Mile Canyon. The sites yielded ceramics dating to the Fremont period; circular, rock-lined, semisubterranean dwellings; dry-laid masonry structures; and at least one burial (Gillin 1955).

The Flat Canyon Archaeological District is near the main block of the STSA to the east and is on the National Register of Historic Places. It is included in the Desolation Canyon National Historic Landmark. Only a small portion of the main block of the STSA has been surveyed in detail for cultural resources. The STSA was included in a Class II sample survey (Hauck 1977). Of the 1,747 known cultural resource sites identified by the survey, 8 were located within the main block of the STSA. The sites included lithic scatters, campsites, rock-lined and dry-masonry structures, and rock art (Hauck 1979).

A recent survey of the Kaiser Steel Sunnyside Mine lease adjacent to the main block of the STSA was conducted by Nielson and others (1981). This study concluded that most prehistoric sites are located in primary canyon bottoms and sides, some are located on high altitude flats and benches, and only a few are located on talus slopes and cliffs.

One known prehistoric site is located on the Amoco project area. This site consists of a large lithic scatter and is from the Archaic period. The site was probably used during the Fremont and Shoshonean periods as well (Amoco 1982). Additional prehistoric sites may be located within the main block of the STSA as surveys are completed.

Impacts to cultural resources could occur from exploration, strip mining, in-situ recovery, plant construction, product transportation, off-site disposal activities, and other activities related to the construction and operation of tar sand facilities. Both surface and sub-surface sites could be destroyed or damaged by such activities. If this occurred, there would be a loss of scientific and cultural information and a loss of a portion of the resource base for future research. The loss of any information could have a significant impact on efforts to reconstruct the prehistory and history of the region.

Should the conversion applications and plans of operations be approved, in accordance with pertinent historic preservation legislation and BLM policy, lease areas and other properties directly affected by the proposed actions would be subjected to 100 percent surveys of cultural resources prior to any surface disturbance. The surveys will be conducted in consultation with the Authorized Officer and the Utah State Historic Preservation Office.

Existing literature was reviewed to identify known, existing sites that could be affected. The Nine Mile Canyon and the Flat Canyon Archaeological District would not be directly affected by the proposed actions. However, there would be an increased risk of vandalism and inadvertent destruction to the adjacent areas from increased human activity in the main block of the STSA. The prehistoric site located in the Amoco project area would be destroyed; however, some information from the site could be recovered as required by the Authorizing Officer and the Utah State Historic Preservation Office. Should the proposed conversions and plans of operations be approved, this and other sites would be evaluated for significance and mitigated to the extent possible

and appropriate prior to actual surface disturbance. Significant impacts to cultural resources could occur if the resource could not be mitigated by recording and/or excavation or any other means.

Considering the added effects of the interrelated projects, the types of impacts to prehistoric resources would be the same as those just described. However, they could be of greater magnitude due to the additional 2,900 acres that would be disturbed and the greater influx of people.

History

The history of the STSA followed the pattern of settlement and development common to much of the western United States. The first known Spanish contact with central Utah was the Dominquez-Escalante Expedition of 1776 to 1777. By the early 1800s, there was an active fur trade in Utah but it declined after 1840 (BLM 1980b).

The Ute Indians continued to control the Price River Basin and STSA area until 1877 and the creation of the Uintah and Ouray Reservation. Individual farmers settled in the vicinity between 1879 and 1882 (O'Neill 1973). The town of Price was established in 1882 in anticipation of the railroad (Lever 1898). Coal was mined in the late 1880s and has continued as the major industry in the area. Bituminous sandstone was first quarried in the STSA in 1892 (Amoco 1982).

Five historic sites are located within the main block of the STSA. Two sites—the Sunnyside Mine and the Bruin Point-Water Canyon Mine and Tramway—are associated with early mining. The tramway carried bituminous material from the portals to disposal areas in Water and Whitmore canyons. The tramway system is considered potentially eligible for listing on the National Register of Historic Places and may be affected by project activities (Amoco 1982).

Three historic sites are located within the Chevron interrelated project area. They include a scatter of artifacts, old structure foundations, and old coke ovens (Chevron 1982).

Additional historic sites may be located within the main block of the STSA as surveys are completed. Impacts could occur to historic resources from exploration and project related activities as described for prehistoric resources. If this occurred, there would be a loss of historic information that could have a significant impact on efforts to reconstruct the history of the region.

Should the conversion applications and plans of operations be approved, surveys for historic resources would be conducted as described for prehistoric sources. The surveys would be conducted in consultation with the Authorized Officer and the Utah State Historic Preservation Office.

The historic tramway associated with the Bruin Point-Water Canyon mine could be affected by road improvements necessary for tar sand recovery. The Sunnyside mine could be affected by the increase of people to the area. These and other historic sites would be evaluated for significance and mitigated to the extent possible and appropriate prior to actual surface disturbance as described for prehistoric resources.

Considering the added effects of the interrelated projects, the types of impacts to historic resources would be the same as those described previously. The three historic sites located within the Chevron interrelated area would be affected by tar sand development.

3.A.11 PALEONTOLCGY AND MINERAL RESOURCES

Impact Significance Criteria

In order to determine significance of predicted impacts, impact significance criteria were developed. These criteria are based on: (1) professional experience concerning formations and mineral resources that occur in the Sunnyside STSA, and (2) the paleontological resources known to be associated ith deltaic depositional environments.

Impacts to geology and mineral resources are considered significant if other energy resources (oil, gas, coal, oil shale) would be precluded from recovery.

Impacts to paleontology are considered significant if fossils of scientific value would be destroyed without recording their occurrence.

Paleontology

The Sunnyside STSA is located in a portion of Utah that shows a change in the rock record from Cretaceous marine deposition to lower Tertiary (Eocene) nonmarine deposition. The marine deposition represents a sequence of shales interfingered with pulses of shoreline deposits, delta sequences, and beach sands. It is common to find coals in association with these interfingered deposits—particularly the delta sequences. The nonmarine deposition occurs above the marine sequence and is marked by an erosional unconformity known as the Ohio Creek Conglomerate. Above this are the Wasatch and Green River formations, which contain the bituminous sandstones.

The Wasatch Formation marks a period of fluvial deposition of sandstones and conglomerates interbedded with shales. This formation contains the bulk of the bituminous sandstones, which are primarily in the sandstones. The lower part of Wasatch Formation contains few or no fossils, because a high energy depositional environment does not lend itself to preservation; however, the upper portion of the Wasatch Formation contains numerous trace and body fossils. Common fossils are bone and plant fragments, fish scales, and small gastropods.

The Green River Formation marks a period of lacustrine deposition of mudstones, sandstones, and shales. The contact with the underlying Wasatch Formation is gradational. Bituminous sandstones in the Green River Formation are concentrated in sandstones in the lower portion; some deposits are found throughout. Trace and body fossils in the Green River Formation are numerous and contain fish remains, fossil leaves, and other plant remains.

Surface mining of the tar sands would destroy many trace fossils and fewer numbers of body fossils. This type of mining would occur primarily in the Roan Cliffs area or the western portion of the main block of the STSA. In the eastern portion of the main block, the dip of the strata precludes surface mining, and in-situ recovery would be used. With this type of resource recovery, loss of fossils would be minimal.

The loss of fossils from surface mining would be a minor impact when compared to the knowledge gained through potential visual examination of the various sedimentary facies. Such examination only would be possible in the western, surface-mined portion of the STSA.

Mineral Resources

The Sunnnyside STSA contains 1.6 billion cubic yards of measured, indicated, and inferred bituminous sandstone, half of which is believed to contain at least 9 percent bitumen by weight (Holmes and Page 1956).

Measured and indicated bituminous sandstone amounts to 900 million cubic yards and inferred 700 million. Assuming that the bituminous sandstone has a specific gravity of 2.1 and a bitumen content of 9 percent by weight, a cubic yard of bituminous sandstone weighs 1.77 tons and contains 38.2 gallons of bitumen. On this basis the measured and indicated bituminous sandstone contains at least 409,500,000 barrels of bitumen and the inferred material contains 318,500,000 barrels. This makes a total of 728,000,000 barrels, exclusive of material assumed to contain less than 9 percent bitumen (Holmes and Page 1956).

Close to 95 percent of the calculated and estimated reserves of the Sunnyside deposits are in the Wasatch Formation, almost all in sandstones. The estimate by Holmes and Page (1956) arbitrarily limited the reserve downdip from the outcrops in the cliffs. The asphalt-impregnated beds are known to persist for some distance downdip, beyond the arbitrary boundary assumed by Holmes and Page. Separate but related deposits are also known to exist to the northwest and southeast. If these uncalculated reserves are added to the below-grade reserves, not included by Holmes and Page, the total reserve is possibly 2.5 to 3 billion barrels (Ball Assoc., Ltd. 1965).

More recent estimates (Ritzma 1979) indicate 3.5 to 4.0 billion barrels of oil in-place, of which 1.25 billion are measured and 1.75 billion indicated. Ritzma ranks the deposit as a "giant" tar sand deposit.

Some question exists over the actual number of barrels of oil in-place, due to limited core data. Given the estimated 3.5 to 4.0 billion barrels of the resource and a 330-day production year, the potential exists for about 2.8 billion barrels of

bitumen to be removed from the main block of the Sunnyside STSA as a result of the cumulative effects of the applicants' proposed tar sand developments and the Chevron interrelated tar sand project. Removal of his amount of resource represents about 80 percent of the resource estimated to occur in the STSA. The applicants' proposals collectively would account for 26 billion barrels of this total. Removal of these amounts represent 74 percent of the resource estimated to occur in the Sunnyside STSA.

Other mineral resources are found in close association with the tar sands. Most well known in the region are the oil shale resources. However, in the Sunnyside area, the oil shales tend to be thin, discontinuous, low-grade deposits.

The main block of the Sunnyside STSA is known to have some coal deposits; all are found below the tar sands, in association with marine shales. However, none are now producing and production in the past has not been of a commercial scale. The Sunnyside mine is currently producing, but it is outside of the STSA boundary at the town of Sunnyside. Therefore impacts to coal operations would be minimal.

The sand disposal area in Bear Canyon would cover a portion of the U.S. Steel Corporation, B Canyon mine. The mine has been permitted and is currently owned by SOHIO. There is sufficient room to move the disposal pile if SOHIO requires it. However, the current placement of the spent sand disposal pile should not conflict with the proposed coal mine. For a detailed discussion of the B Canyon mine see the **Final Environmental Statement, Development of Coal Resources in Central Utah**, Part 2, 1979, Dept. of the Interior, U.S. Geological Survey.

Oil and gas operations near Cottonwood Canyon and other future operations in and near the main block of the Sunnyside STSA would not be affected by the proposed tar sand projects.

3.A.12 WILDERNESS RESOURCES

Impact Significance Criteria

Direct impacts were considered to be significant if any proposed conversion area or its related facilities, or any interrelated project would cross the boundary of a BLM-administered Wilderness Study Area (WSA) or Appeal Area subject to the **Interior Management Policy and Guidelines for Lands Under Wilderness Review** (BLM 1980c).

Indirect, secondary impacts that would permanently alter wilderness characteristics of a WSA also were considered significant. Examples of a significant indirect, secondary impact would be water quality degradation that would permanently impair fishing opportunities within the boundaries of a wilderness unit, or major increase in visitors to a wilderness unit that would jeopardize solitude and natural characteristics.

Three areas administered and managed by the BLM and under review and study for potential wilderness designation are located outside the main block of the STSA, but within the area of influence that could be affected by the applicants' proposed tar sand development. The units are the Turtle Canyon A (UT-060-067), the Desolation Canyon WSA (UT-060-068A), and the Jack Canyon Appeal Area (UT-060-0680) (BLM 1980a).

These WSAs and Appeal Area are managed under the BLM's Wilderness Interim Management Policy. Any development that would directly or indirectly affect these units would be subject to the Interim Management Policy nonimpairment standard (BLM 1979). Under this standard, only temporary uses that are substantially unnoticeable would be allowed; impairment of wilderness suitability of the WSAs would be prohibited. Existing lease rights for oil and gas development issued prior to October 21, 1976, would not be subject to the nonimpairment standard.

Turtle Canyon WSA

The northern boundary of the approximately 33,690-acre WSA is located approximately 7 miles southeast of Sunnyside, Utah, and 5 miles south of the Sunnyside STSA boundary (Map 3-5, map pocket). The eastern boundary of the WSA parallels Range Creek. The headwaters of Range Creek and various tributaries flowing into the creek flow within the Sunnyside STSA and pass through Mono's proposed conversion area (9 miles north of the WSA boundary).

The WSA contains a highly dissected, rugged topography with areas of dense vegetative cover. The WSA remains entirely in its natural state, and a variety of wildlife are present. The rugged ridges and

steep canyon walls provide excellent opportunities for solitude experiences and primitive and unconfined recreation including hunting, hiking, and horseback activities. The rugged setting makes these activities challenging.

A preliminary finding made by the BLM recommended that the entire 33,690 acre unit was suitable for wilderness designation (BLM 1983d).

Desolation Canyon WSA

The Desolation Canyon WSA, an approximately 289,650-acre unit, is located adjacent to and east of the Sunnyside STSA (Map 3-5, map pocket). The WSA is about 10 miles east of Sunnyside, Utah.

Due to the size of the unit, the diversity in topography, vegetation, and wildlife, and the many recreation activities that occur, users commonly refer to the WSA as the Green River Wilderness. Wilderness-type recreation uses (hunting, hiking, equestrian), especially floatboating, are well established. Support for wilderness designation of a major portion of the WSA has been also expressed by the Utah Governor's Wilderness Committee.

A preliminary finding made by the BLM recommended approximately 230,000 acres of Desolation Canyon WSA as suitable for wilderness designation (BLM 1983c). Based on the Interior Board of Land Appeals decision in May 1983 and public review comments, the WSA size was recommended for 289,650 acres. The recommended WSA is currently being studied by the BLM for wilderness suitability.

Jack Canyon Appeal Area

The Jack Canyon Appeal Area is approximately 7,500 acres in size and located approximately 16 miles northeast of Sunnyside, Utah, in the vicinity of Upper Jack Creek Canyon and Pine Springs Draw (Map 3-5, map pocket). The closest proposed conversion area would be Sabine's, 3 miles to the west of the WSA boundary.

The Appeal Area is currently in a proposed WSA status, due to an Interior Board of Land Appeals decision (May 1983), and subject to study by the BLM to determine the WSA's suitability for preservation as wilderness.

No significant direct impacts would occur to the Turtle Canyon and Desolation canyons WSAs, or Jack Canyon Appeal Area because none of the proposed conversion areas overlie these unit boundaries.

A potential exists for secondary impacts to wilderness-related values due to air and water quality deterioration. Surface mining activity, plant site emissions, fugitive dust generated from spent sand disposal and the movement of heavy construction equipment along dirt roads could affect wilderness-related values of the Desolation Canyon WSA, and Jack Canyon Appeal Area especially along vista points along the northern portions of these units. Plumes may be perceptible against the sky or light background due to nitrous oxides from the applicants' proposed projects. Particulate emissions could contribute to perceptible contrasts and visual range reductions within the WSA and Appeal Area (Section 3.A.7, Air Quality). Additionally, the sight of surface mining or in-situ recovery facilities could diminish to a certain degree solitude and natural experiences of wilderness users.

Water resource-related impacts to Range Creek would cause significant effects upon water quality within the Turtle Canyon and Desolation Canyon WSAs. Increased sediment concentrations and increased water temperature due to mining activity on Mono's proposed conversion area and potential leachate from the spent sand area to be located immediatedly adjacent to the upper reaches of Range Creek likely would diminish the quality of the trout fishery (Section 3.A.1, Water Resources; Section 3.A.4, Wildlife). Primitive recreational values, therefore, could be permanently and adversely altered through impairment of wilderness characteristics (naturalness) along the Range Creek drainage of both WSAs.

Collectively, population growth in Carbon and Emery counties, Utah, due to the applicants' proposed tar sand developments, would not be expected to cause significant impacts to wilderness characteristics or wilderness-related values of the Turtle Canyon and Desolation Canyon WSAs, or Jack Canyon Appeal Area (refer to Section 3.A.2, Socioeconomics, for population statistics). However, cumulative population increases due to the proposed actions and interrelated projects would likely cause impacts to wilderness characteristics or wilderness-related values of these units. People pressure could affect solitude experiences. The likelihood for creation of

some new jeep trails within certain accessible portions of the WSAs and Appeal Area could increase, as would the incidences of poaching and wanton killing of wildlife (Bradley 1976). Greater public demand from "new comers" for a wilderness river running experience on the Green River also would be expected to occur. The likelihood for destruction and vandalism of cultural and other resource values enjoyed by wilderness users would increase, as well.

3.A.13 CONFLICTS WITH LAND USE PLANS, POLICIES, AND CONSTRAINTS

Impact Significance Criteria

Any identified conflicts between proposed project facilities or activities and land use plans, regulations, or controls adopted or under official consideration by federal, state, or local governments were considered to be significant.

Summary

Based on the analysis of the proposed actions and the impact significance criteria, it is predicted that some of the applicants' proposed plans of operations would conflict with restrictions on development within 4,040 acres of special watershed management areas. These areas have been withdrawn or restricted from certain types of activities that could degrade water resources. A management decision would be required to approve development on areas that would affect the watershed management areas. For a complete discussion of the laws that apply to the special watershed areas, see Appendix A-5, Water Resources.

Proposals to develop areas around Bruin Point could be in conflict with BLM Management Framework Plan and Title V Section 501 (a)(5) of the Federal Land Policy and Management Act of 1976, if the applicants restrict the use of Bruin Point as a communication equipment location.

Conflicts with Carbon County land use plan; the towns of Sunnyside and East Carbon; and the Bureau of Land Management could be possible. However, specific conflicts cannot be identified at this time, because project designs presently are not sufficiently developed. Both collectively and cumulatively, nonconformance with BLM land use management plans, the Carbon County land use plan, and the towns of Sunnyside and East Carbon could be resolved through amendments to those plans so that there would be no significant impacts to the land use plans.

3.B PARTIAL CONVERSION ALTERNATIVE AND/OR SPECIAL MITIGATION

Under the partial conversion alternative and/or special mitigation (hereafter referred to as partial conversion alternative) only part of the land proposed for conversion would be approved and developed (Map 1-5, map pocket). Critical areas (as defined in Section 1.B, Partial Conversion Alternative) that would undergo significant adverse impacts under the proposed actions were not included in this alternative. It is assumed that one 75,000 barrels per day (bpd) tar sand processing plant (centrally located near Sunnyside) and one steam generation plant in support of a 5,000 bpd in-situ recovery operation (located in the northeast part of the main block of the STSA) would be constructed and operated in association with the conversion areas. It is assumed that the conversion areas included in this alternative would support an 80,000 bpd industry for approximately 45 years. Refer to Section 1.D, Partial Conversion Alternative, for additional details on the parameters of this alternative.

3.B.1 WATER RESOURCES

The primary effect of the partial conversion alternative on water resources would be to minimize surface disturbance in watersheds that are currently, or have the potential to be, used as culinary water supplies. This alternative would protect the headwaters of Range Creek and the right fork of Grassy Trail Creek. These two areas are critical to the high quality waters that exist on the main block of the Sunnyside STSA. Table 3-26 summarizes the watershed impacts of this alternative.

In addition to protecting the headwaters of streams, the amount of special watershed management areas that would conflict with current withdrawals would be reduced to 1,280 acres.

TABLE 3-26
SUMMARY OF WATERSHED IMPACTS
(Partial Conversion Alternative)

Watershed	Land Disturbence (acres) Collective	Cumulative	Potential to Exceed State Standerds	Springs Total In Watershed	Number Affected	Deep Aquifer	Floodplains	Other
Grassy Trail Creek	2,728	5,577	Very low	23	0	No affect	No affect	Minor downstream TDS increase
Nine Mile Creek	18,590	18,590	High	85	35	Little or no changes in discharge due to some mine dewetering	Minor alteration	Minor TDS increase in tributary streams

Note: TDS = total dissolved solids.

Grassy Trail Creek Watershed

The potential exists for the applicants to collectively disturb 2,728 acres and the applicants plus the interrelated projects to cumulatively disturb 5,577 acres in Grassy Trail Creek Watershed. These disturbances are expected to have a minimal impact on the water resources in the watershed, because the areas that would be disturbed are distant from critical water resources in the area.

The quality and quantity of water entering Grassy Trail Reservoir would not change significantly from this type of disturbance. This is due to the majority of the headwater areas being left undisturbed. The spent sand disposal area associated with this alternative would be located outside of the drainage area of the reservoir and would not alter existing flows or quality. However, slight increases in total dissolved solids may be experienced in Grassy Trail Creek downstream of the reservoir.

Ground water and floodplains would not be affected by this alternative.

Nine Mile Creek Watershed

The potential exists to collectively disturb 18,590 acres in Nine Mile Creek Watershed. (The interrelated projects would not cumulatively affect this watershed.) Impacts from the partial conversion alternative would be similar to those discussed for this watershed under the proposed actions (Section 3.A.1, Water Resources).

In addition to minimizing the impacts on the various watersheds, the partial conversion alternative would require less process water. Due to this, changes in waterflow and water quality would differ from the proposed actions. Water use associated with actual commercial operation would cause depletions in two streams—the Price River and the Green River. Predicted changes in waterflow and water quality are shown in Table 3-27.

TABLE 3-27
CHANGES IN WATER FLOW AND QUALITY
(Partial Conversion Alternative)

	Price River		Green River	
Parameter	**Collective**	**Cumulative**	**Collective**	**Cumulative**
Annual Water Use[a] (ac-ft)	12,000	12,000	8,738	13,238
Percent reduction in flow	16%	16%	<1%	<1%
TDS Change	little or no change	little or no change	± 1 mg/l	± 1 mg/l

Note: ac-ft = acre-feet; mg/l = million grams per liter; TDS = total dissolved solids
[a]Total water use as measured at Green River, Utah, would be 25,238 ac-ft/yr.

3.B.2 SOCIOECONOMICS

This analysis is also based on the **Socioeconomic Technical Report: Sunnyside Special Tar Sand Area Development Analysis** (Argonne National Laboratory 1983). The same two adjustments are made to the analysis presented in the technical report as are described for the proposed actions and in Appendix A-6 Socioeconomics. Again, the adjusted figures represent less depth of analysis than the estimates in the technical report.

Detailed data on historical and current socioeconomic conditions in the area of influence, assumptions for the baseline projections and the interrelated projects, and analytical methodology are given in the technical report. Description of the area of influence and work force assumptions for the interrelated projects are shown in Appendix A-6, Socioeconomics.

Population and Employment

A description of historical and current population and employment trends and the projected effects of the interrelated projects is included in the proposed actions discussion (Section 3.A.2, Socioeconomics).

Under this alternative the applicants' construction work force would peak in 1987 at 1,877; the permanent operation work force would peak in 2003 at 3,695 (Table 1-13, Section 1.I). However, secondary employment growth would not peak until 2005 (Appendix A-6). The partial conversion alternative would cause a population increase of 17,840 by 2005 (Table 3-28). The cumulative (including interrelated projects) population increase would be 39,170 in 2005. These represent increases of 34 percent and 76 percent, respectively, over the 2005 baseline for the area of influence.

TABLE 3-28
POPULATION IMPACTS
(Partial Conversion Alternative)

	1980	1989	2005	1980	1989	2005
		Total Area of Influence			**Carbon County**	
Baseline Population	33,630	48,190	51,830	22,179	33,520	37,280
Applicants' Collective Impacts[a]		10,000	17,840		8,880	16,290
Percent Increase Over Baseline		21	34		26	44
Interrelated Projects		16,010	21,330		13,750	17,920
Cumulative Impacts		26,010	39,170		22,550	34,210
Percent Increase Over Baseline		54	76		27	92
Total Population	33,630	74,200	91,000	22,179	56,070	71,490
		East Carbon			**Sunnyside**	
Baseline Population	1,942	1,280	995	811	400	315
Applicants' Collective Impacts[a]		1,860	3,640		650	1,280
Percent Increase Over Baseline		145	366		162	406
Interrelated Projects		1,250	1,530		430	540
Cumulative Impacts		3,110	5,170		1,080	1,820
Percent Increase Over Baseline		243	420		270	578
Total Population	1,942	4,390	6,165	611	1,480	2,135
		Helper			**Unincorporated Areas of Helper CCD**	
Baseline Population	2,724	3,820	4,100	1,729	2,450	2,660
Applicants' Collective Impacts[a]		420	520		280	350
Percent Increase Over Baseline		11	13		11	13
Interrelated Projects		910	1,020		810	680
Cumulative Impacts		1,330	1,540		890	1,030
Percent Increase Over Baseline		35	38		36	39
Total Population	2,724	5,150	5,640	1,729	3,340	3,690
		Price			**Wellington**	
Baseline Population	9,086	15,700	18,500	1,406	2,510	2,800
Appplicants' Collective Impacts[a]		3,630	6,820		1,010	1,890
Percent Increase Over Baseline		23	37		40	68
Interrelated Projects		8,850	9,200		1,900	2,550
Cumulative Impacts		10,480	16,020		2,910	4,440
Percent Increase Over Baseline		67	87		116	159
Total Population	9,086	26,180	34,520	1,406	5,420	7,240
		Unincorporated Areas of Price CCD			**Emery County**	
Baseline Population	4,327	6,960	7,500	11,451	14,670	14,550
Applicants' Collective Impacts[a]		950	1,780		1,200	1,550
Percent Increase Over Baseline		14	24		8	11
Interrelated Projects		1,790	2,410		2,260	3,410
Cumulative Impacts		2,740	4,190		3,460	4,960
Percent Increase Over Baseline		39	56		24	34
Total Population	4,327	9,700	11,690	11,451	18,130	19,510

TABLE 3-28 (Concluded)
POPULATION IMPACTS
(Partial Conversion Alternative)

	1980	1989	2005	1980	1989	2005
		Castle Dale			**Cleveland**	
Baseline Population	1,910	2,850	2,850	522	600	600
Applicants' Collective Impacts[a]		290	430		50	70
Percent Increase Over Baseline		10	15		8	12
Interrelated Projects		540	840		100	140
Cumulative Impacts		830	1,270		150	210
Percent Increase Over Baseline		29	45		25	35
Total Population	1,910	3,680	4,120	522	750	810
		Elmo			**Huntington**	
Baseline Population	300	370	360	2,316	2,970	2,850
Applicants' Collective Impacts[a]		30	50		210	310
Percent Increase Over Baseline		8	14		7	11
Interrelated Projects		60	100		380	600
Cumulative Impacts		90	150		590	910
Percent Increase Over Baseline		24	42		20	32
Total Population	300	460	510	2,316	3,560	3,760
		Orangeville			**Unincorporated Areas of Castle Dale-Huntington CCD**	
Baseline Population	1,309	1,970	1,970	1,489	1,570	1,570
Applicants' Collective Impacts[a]		210	310		40	60
Percent Increase Over Baseline		11	16		3	4
Interrelated Projects		380	600		80	120
Cumulative Impacts		590	910		120	180
Percent Increase Over Baseline		30	46		8	11
Total Population	1,309	2,560	2,880	1,489	1,690	1,750
		Green River			**Unincorporated Areas of Green River CCD**	
Baseline Population	956	960	1,000	166	160	170
Applicants' Collective Impacts[a]		310	260		50	40
Percent Increase Over Baseline		32	26		31	24
Interrelated Projects		80	90		20	10
Cumulative Impacts		390	350		70	50
Percent Increase Over Baseline		41	35		44	29
Total Population	956	1,350	1,350	166	230	220

Note: CCD = Census County Division.

[a]Includes Chevron's interrelated project.

Carbon County would receive the greater population growth. In 2005, the population of Carbon County would increase by 44 percent over baseline as a result of the applicants' projects. This would become an increase of 92 percent when including interrelated projects.

On a community level, Price would experience the greatest population growth as a result of the partial conversion alternative. However, the communities of Sunnyside, East Carbon, and Wellington would have the greatest population growth relative to baseline, with increases in 2005 of 406 percent (applicants) and 578 percent (cumulative) in Sunnyside, 366 percent (applicants) and 520 percent (cumulative) in East Carbon, and 68 percent (applicants) and 159 percent (cumulative) in Wellington. Based on the significance criterion of a 5 percent or more increase over the baseline, both counties and all communities in the area of influence would experience significant population impacts under the partial conversion alternative. Some unincorporated areas within Carbon County are also expected to receive substantial impacts. Based on impacts from the applicants' projects, the unincorporated portion of the Price CCD would have an increase over baseline in 2005 of 24 percent; with interrelated projects, the increase over baseline would be 56 percent.

Table 3-29 presents employment for the affected counties. Employment statistics are not available for community level analysis. For the area of influence, total employment in 2005 is expected to increase by 32 percent over the baseline as a result of the applicants' proposals and 72 percent including interrelated projects.

Carbon County would have the greater increase in employment. In 2005, Carbon County employment would be up more than 40 percent over the baseline due to the applicants' projects, and would be nearly double the baseline with the interrelated projects included. Emery County would experience only a 4 percent employment growth from the applicants' projects, but its growth would rise to 29 percent with inclusion of the interrelated projects. Therefore, both counties would incur significant cumulative impacts, but only Carbon County would be significantly impacted by the applicants' projects alone.

Personal Income

Because existing mining activity gives the area of influence a relatively high per capita personal income (PCPI), the partial conversion alternative would not increase the level of the area significantly over the level projected for the baseline from the applicants' projects alone, but would when the interrelated projects are added. In 2005, the effect of the applicants' proposed projects and the interrelated projects would raise the PCPI level to an estimated $13,385 as compared to the baseline projection of $12,602 (both in 1980 dollars). This would be a significant 5 percent increase.

The majority of personal income increases would occur in Carbon County. In 2005, 91 percent of total personal income increases would be in Carbon County as a result of the applicants' proposed projects. The cumulative impact increase would be slightly different, with 87 percent of the total personal income increase occurring in Carbon County.

The substantial increase in personal income for the area of influence of 1,209 million (1980 dollars) in 2005 would likely have significant effects on the cost of consumer goods and services and on the cost of housing. Significant local price inflation could result from local increased purchasing power. This would have an adverse effect on those with fixed incomes like the elderly and those who do not possess the skills to be employable in the higher income occupations.

TABLE 3-29
EMPLOYMENT IMPACTS
(Partial Conversion Alternative)

	1980	1989	2005	1980	1989	2005
		Total Area of Influence			Carbon County	
Baseline Employment	14,837	20,360	22,900	9,385	13,690	16,020
Applicants' Collective Impacts[a]		4,920	7,360		4,740	7,090
Percent Increase Over Baseline		24	32		35	44
Interrelated Projects		8,420	9,030		6,990	7,280
Cumulative Impacts		13,340	16,390		11,730	14,370
Percent Increase Over Baseline		66	72		86	90
Total Employment	14,837	33,700	39,290	9,385	25,420	30,390
		Emery County				
Baseline Employment	5,452	6,670	6,880			
Applicants' Collective Impacts[a]		180	270			
Percent Increase Over Baseline		3	4			
Interrelated Projects		1,430	1,750			
Cumulative Impacts		1,610	2,020			
Percent Increase Over Baseline		24	29			
Total Employment	5,452	8,280	8,900			

[a]Includes Chevron's interrelated project.

Housing

The impacts of the partial conversion alternative would seriously test the ability of the affected communities to provide adequate and affordable housing. Table 3-30 shows the additional household demand that would result from the applicants' proposed projects, the interrelated projects, and the cumulative effects from both. The 1980 column shows the total housing supply in that year. For the socioeconomic area of influence, the percentage increases over baseline would be 32 percent in 2005; with interrelated projects, increased housing demand would be 70 percent in 2005. Carbon County would experience the majority of the housing demand increases. Price would experience the greatest absolute housing demand increases of the communities included in the area of influence. Sunnyside, East Carbon, and Wellington, however, would experience the greatest housing demand increases compared to baseline. Using the significance criterion of 5 percent over baseline, all communities would be significantly affected. Increased housing demand would have a beneficial effect on the housing construction and finance industries. Nevertheless, limited housing supply would likely contribute to land speculation and increased housing costs in all of the significantly affected communities, with the possible exceptions of Cleveland, Elmo, and Green River.

TABLE 3-30
HOUSEHOLDS PROJECTIONS
(Partial Conversion Alternative)

	1980	1989	2005	1980	1989	2005
		Total Area of Influence				Carbon County
Baseline Households	11,454	14,590	15,670	7,794	10,570	11,700
Applicants' Collective Impacts[b]		3,500	5,050		3,080	4,600
Percent Increase Over Baseline		24	32		29	39
Interrelated Projects		5,310	5,930		4,560	4,980
Cumulative Impacts		8,810	10,980		7,640	9,580
Percent Increase Over Baseline		60	70		72	82
Total Households	11,454	23,400	26,650	7,794	18,210	21,280
		East Carbon			Sunnyside	
Baseline Households	714	400	310	206	130	100
Applicants' Collective Impacts[b]		650	1,030		230	360
Percent Increase Over Baseline		162	332		177	360
Interrelated Projects		410	420		140	150
Cumulative Impacts		1,060	1,450		370	510
Percent Increase Over Baseline		265	468		285	510
Total Households	714	1,460	1,760	206	500	610
		Helper			Unincorporated Areas of Helper CCD	
Baseline Households	1,074	1,200	1,280	659	790	840
Applicants' Collective Impacts[b]		150	150		100	100
Percent Increase Over Baseline		12	12		13	12
Interrelated Projects		300	280		200	190
Cumulative Impacts		450	430		300	290
Percent Increase Over Baseline		38	34		38	35
Total Households	1,074	1,650	1,710	659	1,090	1,130
		Price			Wellington	
Baseline Households	3,195	4,950	5,790	433	790	900
Applicants' Collective Impacts[b]		1,270	1,930		350	530
Percent Increase Over Baseline		26	33		44	59
Interrelated Projects		2,270	2,560		630	710
Cumulative Impacts		3,540	4,490		980	1,240
Percent Increase Over Baseline		72	78		124	138
Total Households	3,195	8,490	10,280	433	1,770	2,140
		Unincorporated Areas of Price CCD			Emery County	
Baseline Households	1,365	2,190	2,350	3,660	4,020	3,970
Applicants' Collective Impacts[b]		330	500		420	450
Percent Increase Over Baseline		15	21		10	11
Interrelated Projects		600	660		750	950
Cumulative Impacts		930	1,160		1,170	1,400
Percent Increase Over Baseline		42	49		29	35
Total Households	1,365	3,120	3,510	3,660	5,190	5,370

TABLE 3-30 (Concluded)
HOUSEHOLDS PROJECTIONS
(Partial Conversion Alternative)

	1980	1989	2005	1980	1989	2005
		Castle Dale			**Cleveland**	
Baseline Households	622	780	780	156	170	160
Applicants' Collective Impacts[b]		100	120		20	20
Percent Increase Over Baseline		13	15		12	12
Interrelated Projects		180	230		30	40
Cumulative Impacts		280	350		50	60
Percent Increase Over Baseline		36	45		29	38
Total Households	622	1,060	1,130	156	220	220
		Elmo			**Huntington**	
Baseline Households	90	100	100	757	810	780
Applicants' Collective Impacts[b]		10	10		70	90
Percent Increase Over Baseline		10	10		9	12
Interrelated Projects		20	30		130	160
Cumulative Impacts		30	40		200	250
Percent Increase Over Baseline		30	40		25	32
Total Households	90	130	140	757	1,010	1,030
		Orangeville			**Unincorporated Areas of Castle Dale-Huntington CCD**	
Baseline Households	397	540	530	414	440	430
Applicants' Collective Impacts[b]		70	90		10	20
Percent Increase Over Baseline		13	17		2	5
Interrelated Projects		130	160		30	30
Cumulative Impacts		200	250		40	50
Percent Increase Over Baseline		37	47		9	12
Total Households	397	740	780	414	480	480
		Green River			**Unincorporated Areas of of Green River CCD**	
Baseline Households	388	260	270	37	40	50
Applicants' Collective Impacts[b]		110	70		20	10
Percent Increase Over Baseline		42	26		50	20
Interrelated Projects		30	20		5	5
Cumulative Impacts		140	90		25	15
Percent Increase Over Baseline		54	33		62	30
Total Households	388	400	360	37	65	65

Note: CCD = Census County Division.

[a]Total available stock of year-round housing units.

[b]Includes Chevron's interrelated project.

Local Government Services and Facilities

Education

Significant increases in teachers and classrooms over projected baseline would be required in the area of influence under the partial conversion alternative. Carbon County would be the most severely affected, having a demand for an additional 200 teachers and classrooms by 2005 as a result of the applicants' proposed projects. This represents a 106 percent increase over the number required by baseline growth. With interrelated projects, the increase would be 410 teachers and classrooms, or 217 percent, by 2005. Emery County would not be significantly affected by the applicants' tar sand development alone, but would have a significant demand increase of 35 teachers and classrooms (57 percent) by 2005 with addition of the interrelated projects. Such large increases in classrooms would require the expansion of the school systems to at least equal this demand, since the baseline demand would eliminate any existing capacity.

Medical

All medical services and facilities would be severely affected under the partial conversion alternative, because no additional capacity would be available to support the increased demand caused by the applicants' proposals and the interrelated projects. Even under the baseline demand, there will be a need for additional physicians, dentists, and hospital beds by 1985. Carbon County would experience the most significant impacts, but Emery County could also be highly affected if its present lack of services continues to exist by that time. Under the partial conversion alternative, the area of influence would have a demand for an additional 12 physicians and 9 dentists (100 percent and 90 percent, respectively, over baseline demand) by 2005 as a result of the applicants' proposed projects. Additional hospital beds would also be required, with a 72 percent increase in the socioeconomic area of influence by 2005. Addition of the interrelated projects would raise these needs to 27 physicians (225 percent increase), 20 dentists (200 percent increase), and 130 hospital beds (153 percent increase) by 2005.

Social and Mental Health Services

Understaffing and rising case loads presently affect the social and mental health services in the area of influence. It is estimated that an additional psychologist and 10 more social workers would be required as a result of baseline growth in the next 10 years (Walker 1983). Increased population caused by the applicants' proposed projects and the interrelated projects would create a further need for 2 psychologists and 26 social workers by 2005.

Law Enforcement

Significant increases over baseline in demand for law officers and patrol cars would occur in the area of influence under the partial conversion alternative. By 2005, Carbon County would have an increase in demand over baseline of 110 percent for law officers and patrol cars as a result of the applicants' tar sand development, and 232 percent with addition of the interrelated projects. Emery County's demands, while large in terms of percentage, would be small in number. Jail facilities would also have to be expanded, particularly in Carbon County where the facility is presently overcrowded.

Fire Protection

Additional fire equipment would likely be required in the area of influence, but available data does not allow numerical estimates. It is also likely that at least some of the communities would no longer be able to rely on volunteer fire departments.

Sewer

Sewage system capacity figures are not available for several of the communities. Of those that are available, the system in Cleveland and Elmo and the combined Castle Dale-Orangeville system should be adequate for the cumulative population growth projected under the partial conversion alternative. However, the systems in both East Carbon (including Sunnyside) and Huntington would be overloaded by the construction peak in 1989. The combined system of Price, Helper, and Wellington is currently over design capacity. A planned expansion of the system to a capacity sufficient for 31,500 population would still fall short of the needs in the peak construction year of 1989, when a combined population of 36,700 is projected for the three towns.

Water

Increased demands for water in the area of influence resulting from the applicants' tar sand development under the partial conversion alternative would be significantly over the increases required under the baseline in both Carbon and Emery counties. Water demand in Carbon County, as measured by number of water system connections, would be increased 108 percent over baseline by 2005 from the applicants' tar sand development and 227 percent with the addition of the interrelated projects. In Emery County, the comparable increases would be 50 percent and 160 percent.

The available information on the community water systems indicates little or no excess capacity in terms of number of connections. In Carbon County, the Price water treatment plant's design capacity is considered well under peak demand. Scofield Reservoir, the sole source of water for Wellington and the unincorporated area surrounding Price and Wellington, is currently being used at 50 to 60 percent of its capacity. In Emery County, the system that serves Cleveland, Elmo, Green River, Huntington, and Orangeville can accommodate no new connections. The Castle Dale system's maximum number of connections would be exceeded in the peak construction year of 1989.

Local Government Finance

Current financial data on the counties, communities, and other taxing districts in the area of influence are included under the proposed actions discussion. Additional fiscal information is provided in the socioeconomic technical report.

It is expected that severe fiscal pressure would result from the partial conversion alternative unless mitigated by the applicants with some federal and state assistance. The rapid growth in population would cause immediate service demand increases. Revenues would lag initially, and coordinated mitigation planning, such as that required by Utah Senate Bill 170 and Carbon County Conditional Use Permit, would be necessary to avoid severe short-term service inadequacies.

Because demands on local infrastructure from baseline growth would equal or exceed their present capacities in many cases, the additional demands that would be imposed by the applicants' developments and the interrelated projects would require significant increases in capacity, particularly in Carbon County. Expansions would be needed in school classrooms, medical facilities, jails, and many of the water and sewer systems, and probably in other facilities that were not included in this analysis. A majority of the additional capacity would be needed to meet the demands of the construction period, but the largest part of the increased revenues from the developments would become available only after the building of mining operations. Also those revenues would accrue largely to the counties, since the mines would be located in unincorporated areas, whereas much of the infrastructure costs would be borne by the communities.

Operating expenditures would be increased by needs for additional administrative and professional staff, greater demands on public safety and social welfare services, and the operation and maintenance costs of the expanded infrastructure.

Other Affected Industries

Hunting, Fishing, and Noncomsumptive Wildlife Use Expenditures

Under the partial conversion alternative, and using data supplied by the Utah Division of Wildlife Resources, the estimated increases in hunter expenditures in 1985, over 1980, in Carbon County would be $1,467 under the collective scenario, while increases in hunting expenditures in 1995, over 1980, due to the partial conversion alternative would be $208,900. For nonconsumptive uses of wildlife, the estimated expenditure increase due to human population increases as a result of the partial conversion alternative in 1985 would be $1,573 and, in 1995, would be $223,394.

Under the cumulative scenario, hunting expenditure increases in 1985, over 1980, would be $108,710, while in 1995 it would be $574,998. Nonconsumptive uses of wildlife and their related expenditure increases would be $116,155 in 1985 and, in 1995, would be $914,859.

Quality of Life

The local social changes associated with the projected population growth could be quite significant under the partial conversion alternative, particularly in East Carbon, Sunnyside, and Wellington. These changes are described in detail under the proposed actions, Section 3.A.2, Socioeconomics.

3.B.3 SOILS AND VEGETATION

Land disturbance associated with conversion of the part of the leases included in this alternative and subsequent development of the tar sand resource collectively would affect 21,318 acres of soils and vegetation over the life of the projects (Table 1-11). Considering the conversion-related development plus the interrelated projects, 24,218 acres of land would be disturbed cumulatively. During steady-state operations, collectively, an estimated average of 5,000 acres of land would be disturbed at any one time by conversion-related activity during the 25-year period of steady-state operations (Figure 2-1, Chapter 2). Considering the interrelated projects in addition to conversion-related activity, 5,500 acres would be the peak disturbance at any one time. Land disturbance would occur over a project life of approximately 49 years (initial construction through termination of commercial operations and reclamation).

Construction of right-of-way facilities associated with development of the conversion areas would disturb collectively an estimated 1,855 acres of land for approximately 1 to 2 years. Cumulatively, an estimated 2,155 acres would be disturbed for 1 to 2 years.

Surface mining and in-situ recovery activities would disturb an estimated 14,846 acres.

Land disturbance associated with spent sand disposal areas would occur on a total of 5,355 acres, of which all the acreage is assumed to be located outside the STSA area, southwest of Sunnyside in the Clark's Valley area (Climatic Zone C, Map 3-2, map pocket).

Soils

Table 3-31 presents the collective and cumulative acreages disturbed by soil groups.

Based on the analysis and the soils impact significance criteria, it is predicted that even though soil impacts would occur, through the use of the applicants' proposed reclamation procedures and the procedures that would be required by BLM (Appendix A-7), generally no significant impacts to soils would occur. However, some localized, very steep areas (about 5 to 8 percent of the total area) resembling talus-like slopes with very low productive capacity, could remain in the reclaimed landscape. These areas would equate to the preconstruction occurrence of rock outcrop (canyon walls and escarpments) in extent and productivity. The mining disturbance and complete alteration of the existing soil profiles and landscape would cause short-term losses of soil productivity and an increase in erosion losses from wind and water during the period from initial disturbance until reclamation and the initial establishment of industry plants.

TABLE 3-31
ACRES OF SOIL GROUPS AFFECTED AND DISTURBED
(Partial Conversion Alternative)

Type of Disturbance	Total Acres Disturbed[a]	Soil Group A[b]	F	M1	M2	M3	MS1	MS2	MS3	Undetermined[c]
Collective Totals										
Leases[d]	14,846	356	254	478	2,538	864	158	8,815	3,485	0
Mine (Surface)	9,436	324	—	42	1,347	858	28	3,734	3,103	0
Plant and Spent Sand Disposal	4,617(262)	286	3,887	80	0	0	364	0	0	0
Plant and In-Situ Mining	5,410	32	254	434	1,191	6	130	2,881	482	0
Ancillary Facilities	1,855(245)	0	0	0	0	0	0	0	0	1,855
Total	21,318	642	4,141	558	2,538	864	522	8,615	3,585	1,855
Interrelated Projects Totals										
Mine (Surface)	1,400	0	0	0	0	118	0	1,223	59	0
Plant and Spent Sand Disposal	1,200(200)	0	1,200	0	0	0	0	0	0	0
Ancillary Facilities	300	0	0	0	0	0	0	0	0	300
Total	2,900	0	1,200	0	0	118	0	1,223	59	300
Cumulative Total										
Leases[d]	14,846	356	254	476	2,538	864	158	8,615	3,485	0
Mine (Surface)	10,836	324	0	42	1,347	976	28	4,957	3,162	0
Mine (In-Situ)	5,410	32	254	434	1,191	6	130	2,881	482	0
Plant & Spent Sand Disposal	5,817	286	5,087	80	0	0	364	0	0	0
Ancillary Facilities	2,155(445)	0	0	0	0	0	0	0	0	2,155
Total	24,218	642	5,341	556	2,538	982	522	7,838	3,644	2,155

Note: Figures shown in parentheses are acreages that would be removed (plant sites and roads) for life of project. Land disturbance acreages also include areas disturbed outside the STSA, consisting mainly of plant sites and spent sand disposal areas.

[a] Total acres disturbed refers to total area that would be disturbed for life of project.

[b] Includes measured, delineated areas of flood plain soils; additional small areas not mappable due to map scale occur throughout the area of influence.

[c] Acreages not determined because locations of facilities are unknown at this time.

[d] Total lease area to be converted that is included in this alternative.

Vegetation

The types of vegetation that would be affected and the types of impacts that would occur due to implementation of the partial conversion alternative would be similar to those discussed for the proposed actions in Section 3.A.3, Soils and Vegetation. However, the magnitude of the disturbance would be different. The estimated total collective and cumulative acreages of the different vegetation types that would be disturbed are shown on Table 3-32.

Based on the analysis and the vegetation impact significance criteria, some significant vegetative impacts could occur. The significance and acreage of impacts would depend on the success of the proposed reclamation programs (Appendix A-7).

Significant vegetative impacts would occur in the areas disturbed in the low precipitation zones (Climatic Zones B and C, Map 3-2, map pocket). These areas may not meet the significance criteria of establishing a ground cover within 5 years. Other significant vegetative impacts would relate to the criteria of not being able to restore the pre-project vegetative type diversity due to changes in topography, slope and aspect causing changes in microclimatic conditions. These would include plants that require specialized micro-environmental conditions, mainly shrubs and trees. The aspen and conifer vegetation types consisting of approximately 5,502 acres would be most strongly affected by surface mining operations. These vegetative impacts and changes would also affect wildlife (Section 3.A.4) and grazing (Section 3.A.9).

TABLE 3-32
ACRES OF VEGETATION TYPES AFFECTED AND DISTURBED
(Partial Conversion Alternative)

Type of Disturbance	Total Acres Disturbed[a]	Riparian[b]	Salt Shrub	Pinyon-Juniper	Sagebrush-Grass	Mountain Shrub	Aspen	Mixed Conifer	Undetermined[c]
Collective Totals									
Leases[d]	14,846	286	0	1,722	3,082	5,456	1,385	2,915	0
Mine (Surface)	9,436	254	0	433	1,079	3,958	1,142	2,570	0
Plant and Spent Sand Disposal	4,617(262)	192	0	3,544	89	782	0	0	0
Plant and In-Situ Mining	5,410	32	0	1,289	2,003	1,498	242	346	0
Ancillary Facilities	1,855(245)	0	0	0	0	0	0	0	1,855
Total	21,318	478	0	5,276	3,171	6,238	1,384	2,916	1,855
Interrelated Projects Totals									
Mine (Surface)	1,400	0	0	0	58	140	373	829	0
Plant and Spent Sand Disposal	1,200(200)	0	1,000	200	0	0	0	0	0
Ancillary Facilities	300	0	0	0	0	0	0	0	300
Total	2,900	0	1,000	200	58	140	373	829	300
Cumulative Total									
Leases[d]	14,846	286	0	1,722	3,082	5,456	1,385	2,915	0
Mine (Surface)	10,836	254	0	433	1,137	4,098	1,675	3,239	0
Mine (In-Situ)	5,410	32	0	1,289	2,003	1,498	242	346	0
Plant and Spent Sand Disposal	5,817	192	1,000	3,754	89	782	0	0	0
Ancillary Facilities	2,155(445)	0	0	0	0	0	0	0	2,155
Total	24,218	478	1,000	5,476	3,229	6,378	1,917	3,585	2,155

Note: Figures shown in parentheses are acreages that would be removed (plant sites and roads) for life of project. Land disturbance acreages also include areas disturbed outside the STSA, consisting mainly of plant sites and spent sand disposal areas.

[a]Total acres disturbed refers to total area that would be disturbed for life of project.

[b]Includes measured, delineated areas of flood plain soils; additional small areas not mappable due to map scale occur throughout the area of influence.

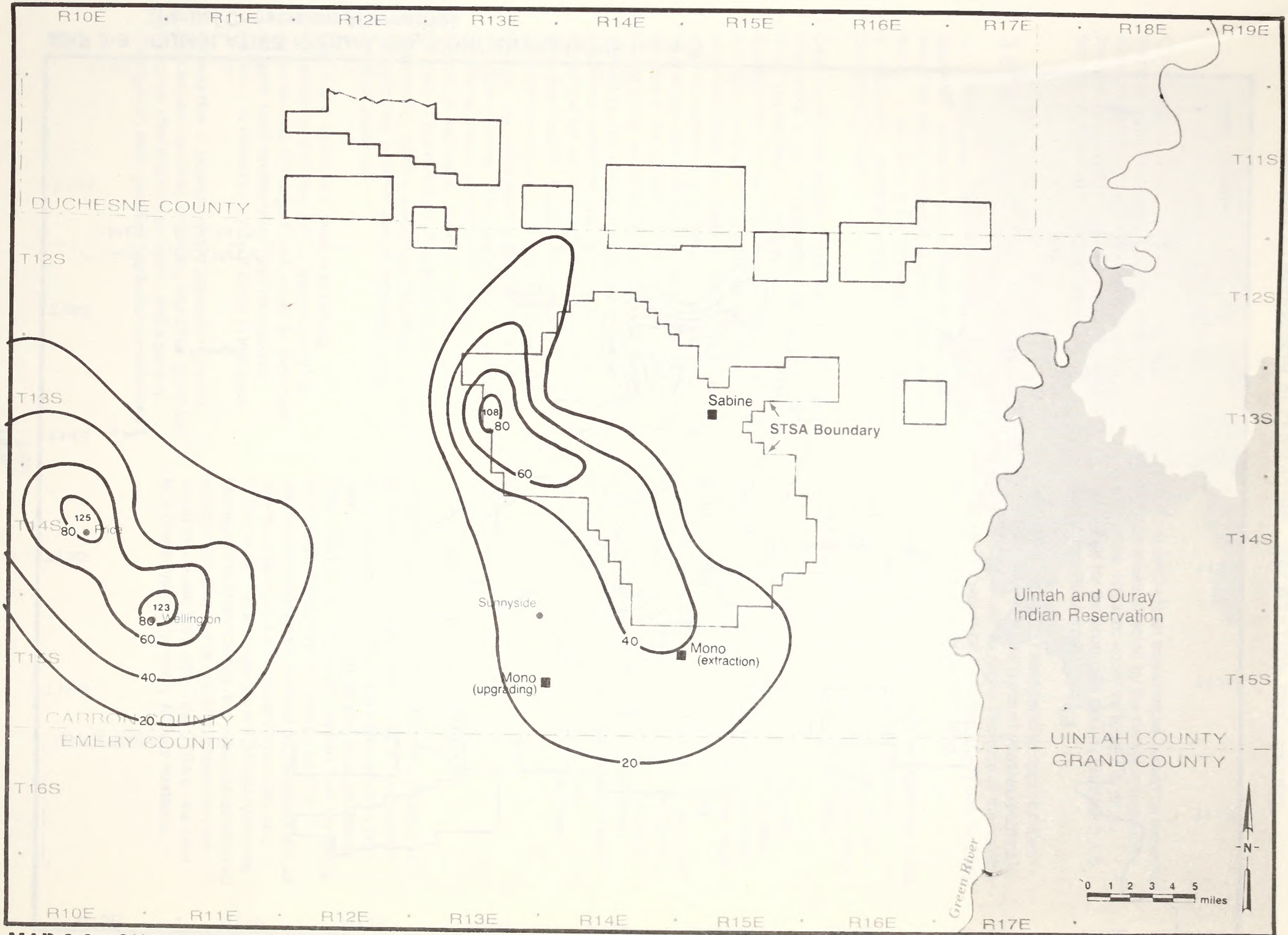
[c]Acreage not determined because locations of facilities are unknown at this time.

[d]Total lease area to be converted that is included in this alternative.

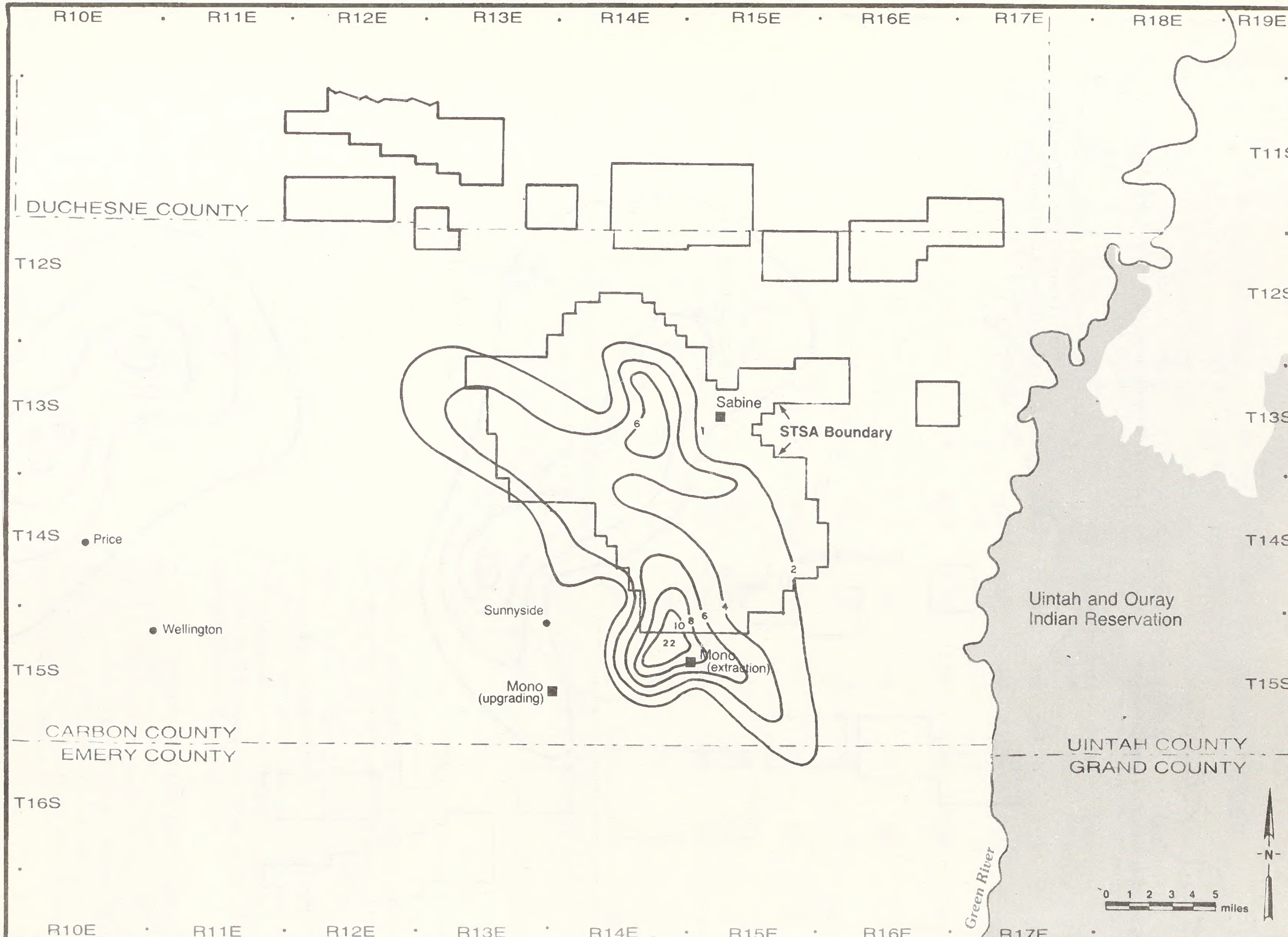
3.B.4 WILDLIFE

Under the partial conversion alternative, activities concerned with the extraction of the tar sand would collectively affect an estimated 5,000 acres per year at any one time (Table 2-1, Chapter 2), and a total of 21,318 acres over the life of the project. The actions concerned with this alternative would disturb about 5 percent of the wildlife habitat in the STSA at any one time. However, since preconstruction forage production may not be attained for 20 or more years, the potential exists to disturb about 22 percent of the wildlife habitat within the main block of the STSA. Considering the effects of interrelated projects in addition to the partial conversion alternative, cumulatively, an estimated 5,550 acres would be disturbed at any one time for the first 25 years of the project, then disturbances would drop to 5,000 acres disturbed at any one time for the next 24 years. These acreages would have the potential to disturb 7 percent and 6 percent, respectively, of the wildlife habitat in the main block of the STSA. In total, an estimated 24,218 acres (25 percent) would be disturbed over the entire project life. The effects of these disturbances would be the same as those discussed for the proposed actions, except for magnitude (Section 3.A.4, Wildlife).

The habitat disturbances would occur progressively over the 49 years, as shown in Figure 2-1 (located in Chapter 2). The number of acres disturbed at any one time would gradually increase until steady-state, full production is achieved. For the next 25 years, 5,000 acres would be disturbed at any one time under the collective scenario.



MAP 3-8 CUMULATIVE ANNUAL TSP CONCENTRATIONS (ug/m³)
(Partial Conversion Alternative)



MAP 3-9 CUMULATIVE ANNUAL SO_2 CONCENTRATIONS (ug/m^3)
(Partial Conversion Alternative)

Cumulative acres disturbed at one time would be the same as collective, except that the number of disturbed acres would increase a little faster and peak at 5,550 for 2 to 3 years then, return to 5,000 for the remainder of the project life.

3.B.5 RECREATION RESOURCES

Impacts to the recreation resource and quality of dispersed recreation experiences for this alternative would be largely attributed to a change in recreation access, a reduction in the recreation land base, and an increase in recreation use due to project-induced population growth.

Over the 49-year project life of the partial conversion alternative, a total of approximately 21,318 acres would be disturbed by the applicants' tar sand development. At any one time during full commercial operation, approximately 5,000 acres would be eliminated from dispersed recreation opportunities such as sightseeing, hunting, camping, and off-road vehicle use. Considering the interrelated projects in addition to the applicants' tar sand development, 24,218 acres would be disturbed over the life of the alternative. Generally, cumulative impacts to dispersed recreation opportunities would be of the same type but slightly greater in magnitude than the collective impacts. Because no tar sand development would occur in the right fork of the Grassy Trail Creek watershed, Whitmore Canyon, the upper reaches of Range Creek, or the Bruin Point area, impacts to recreation access would be minimized, especially along the road/jeep trail from the town of Sunnyside northward to Bruin Point. Sightseeing, hunting, camping, and off-road vehicle opportunities in these favorite recreation areas would be protected.

Few, if any, secondary impacts to fishing opportunities and trout fishing quality along the upper reaches of Range Creek would be expected, since tar sand development (and the resultant sediment increases) would not occur in this area.

Impacts due to project-related population growth, such as user conflicts, poaching and other game law violations affecting hunter quality, and a general shifting from semi-primitive recreation experiences to more semi-urban experiences, would be expected in those areas affected by the partial conversion alternative. Impacts would be similar to those described for the proposed actions (Section 3.A.5, Recreation Resources).

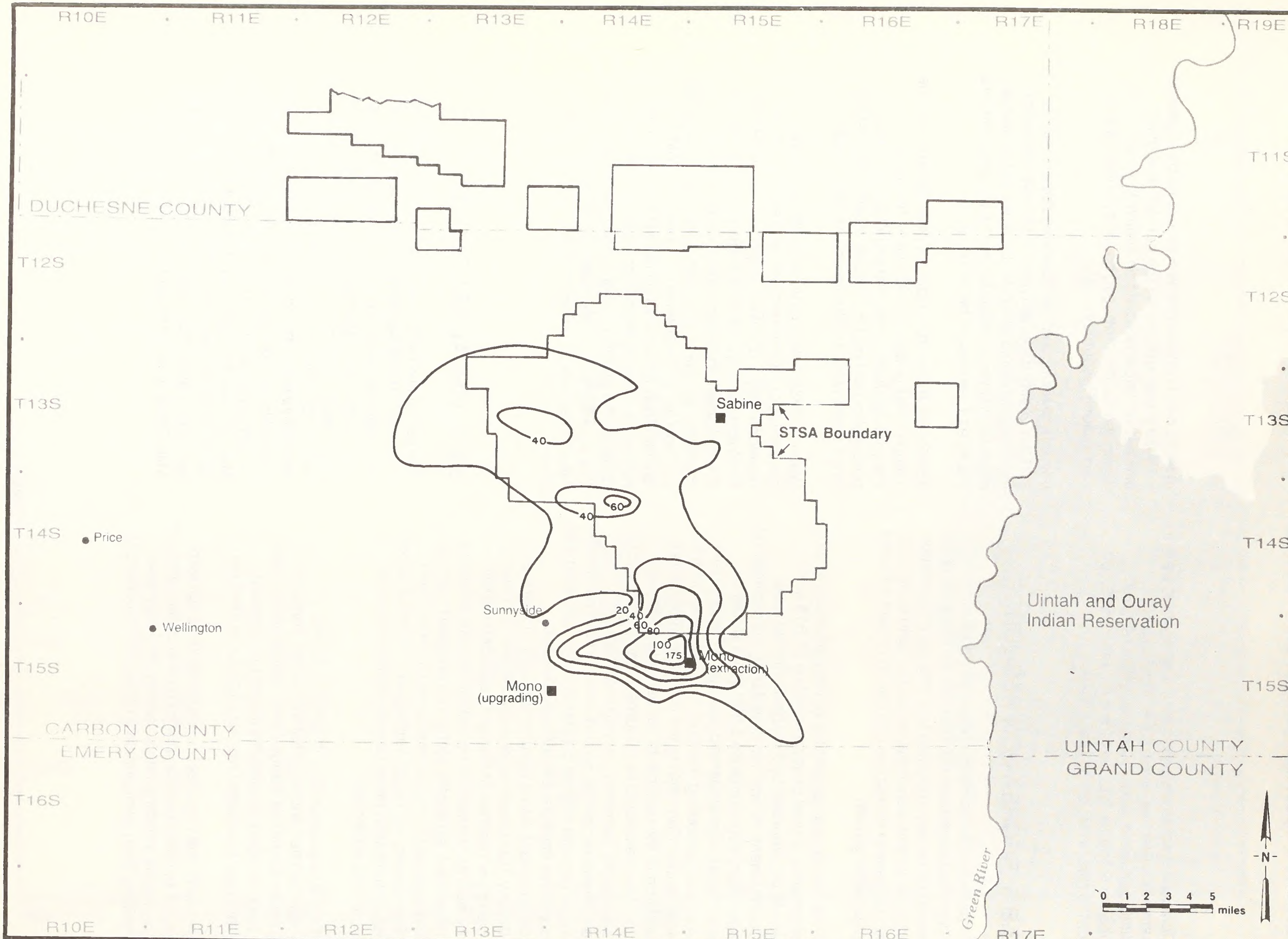
Impacts to hiking and backpacking opportunities and the quality of these types of passive recreation experiences would be slight, because of the number of acres that would be disturbed at any one time and the size of the area to be converted.

The Green River, from Range Creek upstream to the Yampa River (a total of 193 miles), has been identified as having national significance, and as a potential candidate for Wild and Scenic River status in the Nationwide Rivers Inventory (NPS 1983).

Water diversion dam structures, pump houses, access roads, and other facilities related to water development, could likely jeopordize any potential for Wild and Scenic River designation on the Green River. At best, the Green River would not be classified as "wild," but could possibly be classified as "scenic" or "recreational" under the Wild and Scenic River Act. Diversion dam structures, pump houses, and access roads could also severely diminish the quality of river running experiences in this area due to the incompatibility of these structures along pristine stretches of the Green River.

3.B.6 VISUAL RESOURCES

The partial conversion alternative would eliminate portions of those leases proposed for conversion that could be viewed from the valley lands to the west and south of the conversion area, as well as other lease areas not directly viewed from the valley. As a result, none of the impacts under this alternative would be considered highly significant, as defined in Section 3.A.6, Visual Resources, and further explained in Appendix A-9, Visual Resource Management Methodology, but would be considered adverse visual resource impacts. These impacts would be viewed from within the STSA or the Nine Mile Creek area to the north. Activity related to



MAP 3-10 CUMULATIVE ANNUAL NO_2 CONCENTRATIONS (ug/m^3)
(Partial Conversion Alternative)

development of the conversion areas collectively would significantly change about 9,716 acres of land classified as VRM Class II, 3,568 acres classified as VRM Class III, and 4,827 acres classified as VRM Class IV. The impacts due to disturbance of 1,855 acres at unknown locations (acreage required for ancillary facilities) cannot be determined. Considering the interrelated projects in addition to conversion-related activity, approximately 11,116 acres classified as VRM Class II would be significantly affected, as would 3,568 acres classified as VRM Class III, and 6,027 acres classified as VRM Class IV. The impacts to 2,155 acres cannot be determined. See Table 3-33 for a more detailed summary of visual resource impacts.

Surface mining would cause impacts by creating visual contrasts in landform modifications between the existing landscape and the resulting landform that would be present during or following the mining process. Contrasts between existing vegetation types and patterns and those that would result from surface mining and in-situ extraction would create impacts in most conversion areas. Changes in areas to be used for spent sand disposal would be most evident because of the contrast in landform, while vegetation contrasts would be created in varying degrees, depending on the rate of revegetation and how the areas would be viewed. The plant site would create significant impacts by posing a contrasting structure on the existing landscape, as viewed from the valley view points.

TABLE 3-33
SUMMARY OF VISUAL RESOURCE EXISTING CONDITIONS AND SIGNIFICANT IMPACTS (ACRES)
(Partial Conversion Alternative)

Component	VRM Class II[a] Existing[b]	VRM Class II[a] Significantly Affected[c]	VRM Class III[a] Existing[b]	VRM Class III[a] Significantly Affected[c]	VRM Class IV[a] Existing[b]	VRM Class IV[a] Significantly Affected[c]	Undetermined[d]
Mines	8,796	8,796	320	320	320	320	0
Plants	920	920	3,248	3,248	1,504	152	0
Spent Sand Disposal Areas	—	—	—	—	4,355	4,355	0
Ancillary Facilities	—	—	—	—	—	—	1,855
Total Collective Impacts	9,716	9,716	3,568	3,568	6,179	4,827	1,855
Interrelated Impacts	1,400	1,400	—	—	1,200	1,200	300
Total Cumulative Impacts	11,116	11,116	3,568	3,568	7,379	6,027	2,155

[a]Refer to Appendix A-9, Visual Resource Management Methodology, for definitions of VRM classes.
[b]Acres of existing VRM class in conversion areas included in the partial conversion alternative.
[c]Acres that would be significantly affected as defined in Section 3.A.6, Impact Significance Criteria.
[d]Indicates the acreages that would be required for ancillary facilities whose specific locations and impacts are unknown at this time.

3.B.7 AIR QUALITY

Table 3-34 lists the partial conversion alternative collective and cumulative pollutant concentration values compared to the secondary National Ambient Air Quality Standards (NAAQS) and year 2005 estimated background levels, at the receptors showing the highest concentrations. The maximum values would be essentially the same for the collective analysis and the cumulative analysis, but the general distribution of pollutants would change slightly.

The total suspended particulate (TSP) levels shown in Map 3-8 are expected to exceed NAAQS due to the assumed surface mining activities associated with the 75,000 barrels per day (bpd) processing plant. No known fugitive dust control measures are available that would fully mitigate the TSP impacts.

The PSD Class II increments are expected to be exceeded for TSP and for sulfur dioxide (SO_2) in a small area of elevated terrain as in both the collective analysis and cumulative analysis. SO_2 impacts shown in Map 3-9 are mainly due to stack gas emissions. The stack gas impact is on elevated terrain near the projected facility. Locating the plant farther from high terrain or increasing the assumed stack height would significantly reduce the estimated impact.

Nitrogen oxide (NO_x) levels shown in Map 3-10 are estimated to be above the NAAQS, again, due mostly to stack gas emissions.

Visibility impacts would be essentially similar for both the collective and cumulative analyses.

TABLE 3-34
MAXIMUM SO_2, TSP, AND NO_2 CONCENTRATIONS
(Partial Conversion Alternative)

	Maximum Average Concentrations ($\mu g/m^3$)					
	SO_2			TSP		NO_2
Areas of Special Concern	**3-hour**	**24-hour**	**Annual**	**24-hour**	**Annual**	**Annual**
NAAQS	1300	365	80	150	60	100
Class II Areas						
PSD Class II Increment	512	91	20	37	19	NA
Areas Near Sunnyside STSA						
Collective Impacts	1044(18)	290(7)	22(1)	753(62)	171(19)	174(2)
Cumulative Impacts	1044(18)	290(7)	22(1)	753(62)	171(19)	175(2)
Unintah and Ouray Indian Reservation						
Collective Impacts	9(18)	3(7)	<1(1)	<1(62)	<1(19)	2(2)
Cumulative Impacts	11(18)	3(7)	<1(1)	<1(148)	<1(40)	2(2)

Note: Selection of a different grid origin could result in slightly different maximum concentrations and locations of those maximum due to the terrain variability.
Figures in parentheses represent 2005 Baseline Source Concentrations.

The level 2 visibility screening results for the cumulative analysis are summarized in Table 3-35. Visibility impairment is not expected at Arches National Park, Capitol Reef National Park, Canyonlands National Park, or Dinosaur National Monument. The Uintah and Ouray Indian Reservation could experience visual impacts resulting from NO_x emissions. That is, the plume may be perceptible against the sky or a light background.

Significant road maintenance impacts would occur because of the traffic volume increases even though the level-of-service would not change.

Project-related rail tonnage volume increases would generate significant collective and cumulative impacts to the D&RGW rail spur from Mounds to Sunnyside due to the tonnage exceeding the 5 million gross ton capacity of the spur. The collective impacts would start in 1989, with the peak operation year being 2003. The cumulative impacts would start in 1989, and the peak operation year would start in 1995 and continue for the life of the interrelated projects.

TABLE 3-35
LEVEL 2 VISIBILITY ANALYSIS
(Partial Conversion Alternative)

Observer Point Location	Contrast Reduction	Visual Range Reduction	Blue-Red Ratio
Panorama Point Arches National Park	0.029	2.7	0.96
Cathedral Valley Overlook Capitol Reef National Park	0.025	2.4	0.99
Murray Point Overlook Canyonlands National Park	0.027	2.5	0.99
Moonshine Rapids Dinosaur National Monument	0.021	1.9	0.96
Buck Knoll Uintah and Ouray Indian Reservation	0.064	6.5	0.77
Peters Point Uintah and Ouray Indian Reservation	0.025	2.4	0.76
EPA Recommended Guidelines	0.100	11.0	0.90

Note: Results presented are for the conversion-related tar sand development plus the interrelated projects.
The recommended criteria has to be exceeded for impacts to contrast and visual range reduction. Visual impacts occur for blue-red ratios less than 0.9.

3.B.8 TRANSPORTATION NETWORKS

Based on analysis of impacts to the roadway system and the railroad system and the impact significance criteria, it is predicted that project-related traffic volume increases collectively would generate significant, transportation-related impacts (lowering the level-of-service below C) in 1989 during the peak construction-operation overlap period and in 2003 during the peak operation year; cumulatively, traffic volume increases would generate significant impacts during the same years. Both collectively and cumulatively, the significant impacts would occur along US 6 between the SR 123 junction and the town of Helper, SR 123 between the US 6 junction and Sunnyside, and SR 10 between Price and Castle Dale.

Because some of the loaded trucks used during construction and operation could weigh in the range of 90,000 to 200,000 pounds and could range from 25 to 102 feet long, there would be a need for new roadway construction, and realignment and upgrading of all the roads within the STSA. This would have significant collective impacts on the visual resources, and would cause land disturbance. These impacts would begin in 1986, 2 years prior to construction of the plant sites, because roads would have to be built prior to plant construction.

Roadway System

Peak years associated with collective and cumulative construction and operation periods were selected for evaluating impacts. Capacity analyses were completed for annual average monthly traffic and monthly average daily traffic. The monthly average daily traffic relates to June peak traffic demand conditions.

Under the maximum peak demand condition for the projected peak years of 1989 and 2003, collectively, 6 and 8, respectively, of the 16 road segments of the project area are operating below the level-of-service; cumulatively, 8 and 11, respectively, of the 16 road segments are below level-of-service C. This is based on service volumes for level-of-service C and computed from standards from the American Association of State Highways and transportation officials, and used by the Utah Department of Transportation (UDOT) as a design standard for rural minor arterial and major collectors. According to the UDOT, the 1982 existing traffic and the road facilities serving the project area are generally in a stable flow condition. The project traffic associated with the partial conversion alternative would cause a down grading of the level-of- service on a majority of the road segments within the project area.

The projected baseline estimates, vehicle trips per day (VTPD), total peak vehicle trips per day, percentage increase project baseline and level-of-service for the collective and cumulative construction-operation overlap years and the operation years are shown on Table 3-36. The table also identifies 16 specific roadway segments (located on US 6 between Green River and Helper, on SR 123 between US 6 junction and Sunnyside, and on SR 10 between Price and Castle Dale) and defines those segments that would have impacts.

The collective impacts for the peak year 1989 would add a total of 6,080 VTPD associated with the partial conversion alternative construction-operation overlap year. This would have a short-term impact by lowering the level-of-service below C. Peak year 2003 would add a total of 8,030 VTPD to the partial conversion alternative operation period. This primarily would be due to the lowering of UDOT's level-of-service C, a preferred maximum traffic volume for rural minor arterial and collector roadways. Table 3-36 identifies 6 specific segments in 1989 and 8 in 2003 where the level-of-service would be below C. These segments would have significant traffic volume impacts. These segments are identified on Map 1-3 (Section 1.A.5).

The cumulative traffic volume associated with operating the interrelated coal mines and the Chevron interrelated project would add (in 2003) a total of 7,642 VTPD to the roadway system (US 6, SR 10, and SR 123) and would increase the impacts defined in the collective section and extend the impacts to specific roadway segments on SR 10 between Price and Castle Dale. The operation-associated traffic volumes move upward beginning in 1990 (11,330 VTPD) through 2005 (17,002 VTPD), with the peak in 2003 (17,672 VTPD). Table 3-36 identifies the segments (8 in 1989 and 10 in 2003) that would be significantly affected (level-of-service would be lowered below C).

The vehicle accident rate per million vehicle miles traveled on US 6 between Soldier Summit and Green River for 1982 was 1.22 accidents per million vehicle miles, which is less than the State of Utah's expected rate of 2.06 accidents per million vehicle miles for this type of road. On SR 123 between the US 6 junction and Sunnyside, the 1982 rate was 0.75 accidents per million vehicle miles, which is less than the 2.88 accidents expected; and on SR 10 between Price and Castle Dale, the 1982 rate was 1.29 accidents per million vehicle miles, which also is less than the expected rate of 2.02. The number of traffic accidents per million vehicle miles traveled in 1982 on US 6 between Soldier Summit and Green River was 166, the number for SR 123 between the US 6 junction and Sunnyside was 6, and the number for SR 10 between Price and Castle Dale was 64.

Collectively, in 1989 (the construction-operation overlap period), the conversion-related tar sand development would add 6,080 VTPD to the projected baseline; in 2003 (the operation year), 8,030 VTPD would be added. This additional traffic volume would lower the level-of-service below C and would increase the traffic accidents for specific segments of the road system, as identified in Table 3-36.

Information from the UDOT, Division of Traffic Safety indicates that the traffic accident rates would not significantly increase, but the traffic accidents would be expected to increase in proportion to the increase in volume of traffic. Collectively, in 1989 (the construction-operation overlap year), the 75 percent increase in VTPD would cause about 60

TABLE 3-36
PROJECTED HIGHWAY ANNUAL AVERAGE MONTHLY TRAFFIC
(Partial Alternative)

			COLLECTIVE IMPACTS										
			Construction-Oparetion Overlap Impacts						Operation Impacts				
Road Segment	Traffic Control Point Locetion[e]	1989 Level-of-Service Basalina[c]	Projected 1989 Beseline Estimete (VTPD)[b]	1989 Applicant-Releted Incraase (VTPD)	Totel Peek (VTPD)	Percent Incraase Over Projected Baseline	Laval-of-Service of-Projected Beseline[c]	2003 Leval-Beseline Service Beseline[c]	Projected 2003 Releted Estimete (VTPD)[e]	2003 Applicent Totel Increese (VTPD)	Increese Peek VTPD	Percent Service Projected Beseline	Level-of-Projacted Beseline[c]
US 6													
Junction SR J39	1	C	12,653	425	13,078	3	C	C	14,690	400	15,090	3	C
FAS 298 (old road) 55 Wast of Prica	2	B	8,164	800	8,964	10	C	B	9,478	1,200	10,678	13	C
Bypass Road S of Price	3	B	9,421	3,520.	12,942	37	C	B	10,936	4,830	15,766	44	C
West Incl. Wellington	4	B	6,876	3,520	10,397	53	D	C	7,982	4,830	12,812	61	E
East Incl. Wellington	5	B	4,683	4,135	8,816	88	D	B	5,437	5,680	11,117	104	E
Woodside-FAI 70 West of Grean River	6	B	2,545	220	2,765	9	B	B	2,994	135	3,129	5	B
SR 123													
Junction US 6	7	B	2,718	4,350	7,068	160	C	B	3,155	5,815	8,970	184	D
Junction SR 124	8	C	4,034	5,685	9,719	141	F	C	4,783	7,450	12,233	156	F
South Incl. Sunnyside-North Incl. Sunnyside	9	B	2,015	6,080	8,095	302	D	B	2,338	8,030	10,368	343	E
SR 10													
East Incl. Castla Dala	10	C	3,439	180	3,619	5	C	C	3,993	200	4,193	5	C
Junction SR 29	11	D	5,305	180	5,485	3	C	D	6,159	200	6,359	3	D
South Incl. Huntington	12	D	6,860	310	7,150	5	D	D	7,894	340	8,234	4	E
Junction SR 155 Road to Elmo	13	C	3,883	450	4,333	12	C	C	4,508	480	4,988	11	C
Carbon/Emery County Lina	14	C	3,883	460	4,343	12	C	C	4,508	500	5,008	11	C
Junction SR 122	15	C	4,034	485	4,519	12	C	C	4,684	530	5,214	11	C
Price South Incl. Prica	16	D	6,712	500	7,212	7	D	D	7,759	550	8,309	7	E

TABLE 3-36 (Concluded)
PROJECTED HIGHWAY ANNUAL AVERAGE MONTHLY TRAFFIC
(Partial Alternative)

	CUMULATIVE IMPACTS												
	Construction-Operation Overlap Impacts							Operation Impacts					
Road Segment	Traffic Control Point Location[a]	1989 Level-of-Service Baseline[c]	Projected 1989 Baseline Estimate (VTPD)[b]	1989 Applicant-Related Increase (VTPD)	Total Peak (VTPD)	Percent Increase Over Projected Baseline	Level-of-Service of-Projected Baseline[c]	2003 Level-Baseline Service Baseline[c]	Projected 2003 Related Estimate (VTPD)[a]	2003 Applicant Total Increase (VTPD)	Increase Peak VTPD	Percent Service Projected Baseline	Level-of-Projected Baseline[c]
US 6													
Junction SR J39	1	C	12,653	1,325	13,978	10	C	C	14,690	1,180	15,870	8	C
FAS 298 (old road) SR 55 West of Price	2	B	8,164	2,800	10,964	34	C	B	9,478	3,455	12,933	36	C
Bypass Road S of Price	3	B	9,421	12,170	21,591	129	D	B	10,936	12,110	23,046	111	E
West Incl. Wellington	4	B	6,876	6,780	13,656	99	E	C	7,982	8,280	16,262	104	F
East Incl. Wellington	5	B	4,683	5,195	9,878	111	D	B	5,437	7,580	13,017	139	E
Woodside-FAI 70 West of Green River	6	B	2,545	275	2,820	11	B	B	2,994	180	3,174	6	B
SR 123													
Junction US 6	7	B	2,718	2,620	8,338	207	D	B	3,155	6,630	9,785	210	D
Junction SR 124	8	C	4,034	5,940	9,972	147	F	C	4,383	8,070	12,853	169	F
South Incl. Sunnyside-North Incl. Sunnyside	9	B	2,015	6,335	8,350	314	D	B	2,338	8,645	10,983	370	E
SR 10													
East Incl. Castle Dale	10	C	3,439	865	4,299	25	C	C	3,993	1,035	5,028	26	C
Junction SR 29	11	D	5,305	865	6,170	16	C	D	6,159	1,035	7,194	17	D
South Incl. Huntington	12	D	6,860	1,220	8,080	18	D	D	7,894	1,455	9,349	18	E
Junction SR 155 Road to Elmo	13	C	3,883	1,680	5,563	43	C	C	4,508	2,010	6,518	45	D
Carbon/Emery County Line	14	C	3,883	1,700	5,583	44	C	C	4,508	2,070	6,578	46	C
Junction SR 122	15	C	4,034	1,740	5,774	43	C	C	4,684	2,120	6,804	45	D
Price South Incl. Price	16	D	6,712	1,770	8,482	46	E	D	7,759	2,150	9,901	28	E

Note: VTPD = vehicle trips per day; Incl. = including.

[a]Refers to locations shown on Map 1-3.

[b]Projected 1981 highway traffic volume for US 6, SR 123 and SR 10 by one percent compounded.

[c]American Association State Highway and Transportation (1965) Levels-of-Service. A = free traffic flow, accompanied by low volumes and high speeds; B = stable traffic flow, with operating speeds beginning to be restricted by traffic conditions; C = stable traffic flow, but drivers are restricted in their freedom to select speed, change lanes, or pass; D = approaches unstable traffic flow, with fluctuations in volume and temporary restrictions to flow, which may cause substantial drops in operating speeds; E = unstable traffic flow, with momentary stoppages; F = forced traffic flow, with low speeds and short or long stoppages because of downstream congestion. Level-of-Service = Baseline x factor (Volume Per Hour) - factor (Volume Capacity Ratio and calculated on a highway speed of 60 mph under uninterrupted flow conditions).

additional traffic accidents; in 2003 (the peak operation year), the 131 percent increase in VTPD would cause about 105 additional traffic accidents. This increase in traffic accidents would be a significant impact to the health and safety of the travelers.

The interrelated projects cumulatively would add 15,576 VTPD to the baseline in 1989, and 17,642 VTPD to the baseline in 2003. This additional traffic volume would lower the level-of-service below C and would increase the traffic accidents for specific segments of the road system, as identified on Table 3-36. The segments that would be most affected cumulatively would be on SR 10 between Price and Castle Dale. Utah Department of Transportation indicated that the traffic accident rate would not significantly increase, but the traffic accidents would be expected to increase in proportion to the increase in volume traffic. Cumulatively, in 1989, the 349 percent increase in VTPD would cause about 279 additional traffic accidents; in 2003, the 408 percent increase would cause about 326 additional traffic accidents.

Some of the loaded trucks used during construction and operation could weigh from 90,000 to 200,000 pounds and could range from 25 to 102 feet long. As a result, there would be a need for new roadway construction and realignment, and upgrading of all roads used by the applicants within the Sunnyside STSA. The large and heavy trucks, in most cases, would use the roads within the STSA, but if they are required to use the public roads, the proper special use permits would have to be obtained from UDOT.

Rail System

Collectively, the material and equipment needed to construct the 2 processing plants would not cause the 5-million-gross-ton capacity of the D&RGW railroad spur between Mounds and Sunnyside to be exceeded. The processing plants would be constructed from modules that would be shipped to the East Carbon/Sunnyside railhead and trucked to the plant sites. This could generate oversize loads that would require special handling by the D&RGW railroad. The impact of these oversize loads could be significant.

Collectively, the 2 processing plants would produce 80,000 bpd of synfuel during peak operation. The synfuel could be transported from the plants via truck, rail, and/or pipeline. Estimating the worst case, about half (40,000 bpd or approximately 2.2 million gross tons per year) could be shipped by rail from Sunnyside. The collective tonnage would be close to the established 5 million-gross-tons-per-year capacity of the D&RGW railroad spur and would be very close to a significant collective impact to the rail spur. In order to transport this amount of oil, 73 85-ton railroad tank cars would need to be loaded per day, which equates to approximately 1 84-car unit train per day in and out of the East Carbon/Sunnyside area. Locating adequate land space for construction of speed loading facilities and a rail car storage yard for approximately 2 84-unit trains or 168 tank cars at one time could be difficult.

It would be impractical to assume the remaining 40,000 bpd would be hauled by truck, because this would require 210 trucks per day carrying 8,000 gallons per truck and weighing 30 tons each. Therefore, it was assumed the remaining oil would be transported by pipeline, which would not create any significant impacts to existing transportation networks.

As production approaches the full commercial level of 80,000 bpd, it could be more economical to ship the synfuel by pipeline, which has been suggested by the applicants. Using a pipeline to transport synfuel, when full production levels are reached, could cause a significant financial impact to the railroad due to (1) the reduction in tonnage; and (2) the abandonment of the speedloading facilities and the rail storage siding tracks that were constructed to meet the needs of the developing tar sand industries.

Cumulatively, the interrelated projects would affect the Sunnyside D&RGW railroad spur during the construction years (1987 to 1989). If the material and equipment required exceeded 3 million gross tons per year, it would have a significant, short-term cumulative impact. During operation, the total rail tonnage for the coal mines is estimated to be 7.2 million gross tons per year by 1995. This tonnage would exceed the estimated 5-million-gross-tons-per-year capacity of the rail spur and would have a significant, long-term impact. The cumulative tonnage also would increase the congestion impacts at the rail storage yard in East Carbon/Sunnyside.

Public Transportation

The impacts to public transportation would be related to the projected population increases (40,600

people in 1989 and 57,400 people in 2005). These increases could have a significant, positive impact, because they could enable the Price and Green River airports to support commercial flights.

Neither the collective nor cumulative population increases would cause significant impacts to the passenger rail service or bus service. However, along US 6, population increases could provide the impetus to establish service on SR 10 to the towns of Huntington, Cleveland, Elmo, Orangeville, and Castle Dale, and establish service on SR 123 to the towns of East Carbon and Sunnyside.

3.B.9 AGRICULTURE

Grazing

Land disturbance associated with the partial conversion alternative, collectively, would cause a loss of 279 AUMs of forage per year, which equates to a reduction of approximately 69 head of livestock (cattle) annually based on a 4-month grazing season. Cumulatively, 301 AUMs of forage would be lost per year, equating to a reduction of approximately 75 head of livestock. Refer to Table 3-37 for number of operators and allotments affected, the potential AUMs lost by allotment, and the percentage of each allotment affected. This alternative would affect 16 ranch operators on 6 allotments, with disturbance to grazing occurring over a period of approximately 74 years.

Impacts to grazing caused by land disturbance associated with the partial conversion alternative would be minimized due to the exclusion of mining on approximately 12,250 acres of grazing land and the exclusion of mining from areas of critical livestock water sources that provide water for key livestock grazing areas. Refer to Map 1-5 (map pocket) for areas that are excluded from mining under this alternative. The maintenance of 2,120 acres of grazing land within the Dry Canyon allotment also would minimize the impact to the one operator within this allotment to the point that the operation possibly would be maintained. The reduction of 1,280 acres of grazing land in the Sheep Canyon allotment would minimize impacts to one operator. The protection of some of the main livestock water sources also would minimize grazing impacts within the Green River North, Sheep Canyon, and Dry Canyon allotments.

Refer to the proposed action discussion (Section 3.A.9, Agriculture) for an explanation of the types of grazing impacts that would result from surface mining, spent sand, and in-situ recovery. Map 3-2 (map pocket) shows the locations of the various grazing allotments.

Cropland

No cropland occurs within the STSA area. However, cropland losses are anticipated due to population expansion (Section 3.A.9, Agriculture). Project-related population increases due to mining activities proposed by the 5 applicants would cause the conversion of 2,117 acres of land to homesites and other related support facilities in the areas of Price, Wellington, and Sunnyside. It is estimated that approximately 700 acres of cropland would be converted to urban uses. Based on the impact analysis and the cropland impact significance criteria, this would be insignificant.

TABLE 3-37
GRAZING ALLOTMENTS AFFECTED AND GRAZING LOSSES CAUSED BY THE PARTIAL CONVERSION ALTERNATIVE

	CURRENT STATUS				POTENTIAL GRAZING LOSSES (AUMs)[a]			
Allotment Name and Number	Number of Operators	Acreage Public	Acreage Total	Active Reference (AUMs)	Collective Total	Interrelated Projects Total	Cumulative Total	Percent of Allotment
Cow Canyon (4032)	4	2,145	—	71 (30 Ac/AUM)	46 (5)	0 0	46 (5)	64 (7)
Dry Canyon (4038)	1	14,815	20,680	890 (17 Ac/AUM)	226 (58)	0 0	226 (58)	25 (6)
Green River North (4049)	1	122,845	166,621	8,584 (14 Ac/AUM)	436 (84)	0 0	436 (84)	5 (1)
Mud Springs (4077)	1	21,836	27,859	2,320 (9 Ac/AUM)	483 (87)	0 0	483 (87)	21 (4)
Sheep Canyon (4103)	7	9,170	18,302	696 (13 Ac/AUM)	277 (32)	0 0	277 (32)	40 (4)
Stone Cabin (4109)	2	23,014	30,518	1,625 (14 Ac/AUM)	64 (12)	0 0	64 (12)	4 (1)
Outside[b]	2	—	NA	NA (16 Ac/AUM)	10 (1)	112 (22)	122 (23)	NA NA
Total AUMs Lost/Year					(279)	(22)	(301)	

Note: AUM = animal unit month; Ac/AUM = acres per animal unit month; NA = not applicable.

[a]Figures without parentheses represent forage production (AUMs) per year for the entire proposed conversion area or area affected. Figures enclosed by parentheses represent average forage production (AUMs) lost per year due to mining activities based on a 5-year reclamation schedule (with exception of Amoco).

[b]Grazing parcels outside of named allotment boundaries.

3.B.10 CULTURAL RESOURCES

The impacts of this alternative on historic and prehistoric resources would be similar in nature to those described for the proposed actions (Section 3.A.10, Cultural Resources). It is possible that fewer cultural resources would be affected as fewer acres would be disturbed by this alternative. The cumulative impacts of tar sand development on historic and prehistoric resources would be the same type as described for the collective impacts. However, they could be of greater magnitude due to the additional 2,900 acres that would be disturbed and the greater increase in people.

3.B.11 PALEONTOLOGY AND MINERAL RESOURCES

The partial conversion alternative would collectively and cumulatively remove about 1.1 and 1.3 billion barrels of bitumen or about 31 and 37 percent, respectively, of the resource estimated to occur in the STSA.

Surface mining of the tar sand would destroy many trace and body fossils. The type of mining would occur primarily in the Roan Cliffs area or the eastern portion of the main block of the STSA. In the western portion of the Sunnyside STSA, the dip of the strata precludes surface mining and in-situ recovery techniques would be used. With this type of resource recovery, loss of fossils would be minimal.

The loss of fossils from surface mining would be a minor impact when compared to the knowledge gained through potential visual examination of the various sedimentary facies. Such examination only would be possible in the western surface mined portion of the STSA.

The potential to eliminate mineral resources other than tar sand from recovery due to mining of the tar sand is very remote.

3.B.12 WILDERNESS RESOURCES

No significant adverse impacts would occur to the Turtle Canyon and Desolation Canyon Wilderness Study Areas (WSAs), or the Jack Canyon Appeal

Area, because none of the lease conversion areas included in this alternative would overlie these units.

Secondary impacts to the wilderness resource of the three units and to the quality of the wilderness user experiences would be the same type as analyzed for the proposed actions (Section 3.A.12, Wilderness Resources) but would be less in magnitude. Because the upper reaches of Range Creek would not be developed, no secondary impacts to fishing opportunities or to the quality of the fishing experience along Range Creek within the Turtle Canyon or Desolation Canyon WSAs would be expected.

Air quality related impacts upon wilderness values in the Turtle Canyon and Desolation Canyon WSAs, and the Jack Canyon Appeal Area would be minimal, although plumes from the conversion-related processing plants could be perceptible against the sky or light background due to nitrous oxide emissions (Section 3.B.7, Air Quality).

Impacts due to increased use of these WSAs would be similar to those of the proposed actions (Section 3.B.12, Wilderness Resources) due to a similar project-induced population growth rate. Increased use along favored areas could affect the quality of the wilderness experience (especially the qualities of solitude and naturalness).

3.B.13 CONFLICTS WITH LAND USE PLANS, POLICIES, AND CONSTRAINTS

Based on the analysis of the partial conversion alternative and the impact significance criteria, it is predicted that 1,280 acres of special watershed management areas would require a special management decision to avoid potential conflicts. Proposals to develop areas around Bruin Point could be in conflict with BLM Management Framework Plan and Title V Section 501 (a)(5) of the Federal Land Policy and Management Act of 1976 if the applicants restrict the use of Bruin Point as a communication equipment location. Conflicts with the Carbon County land use plan, the towns of Sunnyside and East Carbon; and the Bureau of Land Management could be possible. However, specific conflicts cannot be identified at this time, because project designs presently are not sufficiently developed. Both collectively and cumulatively, nonconformance with BLM land use management plans, the Carbon County land use plan, and the towns of Sunnyside and East Carbon could be resolved through amendments to those plans so that there would be no significant impacts to the land use plans.

3.C UNITIZED DEVELOPMENT ALTERNATIVE

Under the unitized development alternative, all the lease tracts proposed for conversion would be approved; however, it is assumed that only one 50,000 bpd tar sand processing plant (centrally located near Sunnyside) would be constructed and operated in association with the conversion areas. It is assumed that the conversion areas would support a 50,000 bpd industry for approximately 94 years. Refer to Section 1.E, Unitized Development Alternative, for additional details on the parameters of this alternative.

The untized development alternative would permit tar sand resource to be developed in a slow, orderly fashion, which could provide more lead time to monitor changes and plan for appropriate mitigation. The slow rate of development also could allow more time for surveys to determine the critical resources present.

3.C.1 WATER RESOURCES

Impacts to the individual watersheds associated with this alternative would be the same types as those of the proposed actions. However, because fewer acres would be disturbed at any one time, the degree of impact on an individual watershed component (such as springs and floodplains) would be somewhat less. Water use associated with the unitized development alternative would be somewhat less than the other alternatives, because production is assumed to be at a lower rate. The unitized development alternative would cause depletions in either the Price or Green rivers. Changes in water flow and water quality are shown in Table 3-38. As a result of tar sand development, 18,840 acre-feet per year would be withdrawn from surface waters within the STSA.

TABLE 3-38
CHANGES IN WATER FLOW AND QUALITY
(Unitized Development Alternative)

	Price River		Green River	
Parameter	**Collective**	**Cumulative**	**Collective**	**Cumulative**
Annual water use[a] (ac-ft)	14,340	18,840	14,340	18,840
Percent reduction in flow	19%	25%	<1%	<1%
TDS change	little or no change	little or no change	±1 mg/l	±1 mg/l

Note: ac-ft = acre-feet; mg/l = milligrams per liter; TDS = total dissolved solids.
[a]Total water use as measured at Green River, Utah, would be 18,840 ac-ft/yr.

3.C.2 SOCIOECONOMICS

This analysis is also based on the **Socioeconomic Technical Report: Sunnyside Special Tar Sands Area Development Analysis** (Argonne National Laboratory 1983). The same two adjustments are made to the analysis in the technical report as are described under the proposed action and in Appendix A-6, Socioeconomics.

Detailed data on historical and current socioeconomic conditions in the area of influence, and assumptions for the baseline projections and the interrelated projects are given in the technical report. Description of the area of influence and work force assumptions for the interrelated projects are shown in Appendix A-6.

Population and Employment

A description of historical and current population and employment trends and the projected effects of the interrelated projects is included under the proposed action alternative.

Under this alternative, the applicants' (including Chevron's project on private land) construction work force would peak in 1995 at 475; the permanent operation work force would peak in 2003 at 2,465 (Table 1-13, Section 1.H). However, secondary employment growth would not peak until 2005 (refer to Appendix A-6). The tar sand development assumed under this alternative would cause a population increase of 12,140 by 2005 (Table 3-39) the cumulative (including the interrelated coal mines) population increase would be 31,290 in 2005. These represent increases of 23 percent and 60 percent, respectively, over the 2005 baseline for the area of influence.

Carbon County would receive the greater population growth. In 2005, the population of Carbon County would increase by 30 percent over baseline as a result of the applicants' projects. This would become an increase of 72 percent when including interrelated projects.

On a community level, Price would experience the greatest population growth. However, the communities of Sunnyside, East Carbon, and Wellington would have the greatest population growth relative to baseline, with increases in 2005 of 273 percent (applicants) and 390 percent (cumulative) in Sunnyside, 247 percent (applicants) and 354 percent (cumulative) in East Carbon, and 46 percent (applicants) and 129 percent (cumulative) in Wellington. Based on the significance criterion of a 5 percent or more increase over the baseline, both counties and all communities in the area of influence would experience significant population impacts under the unitized development alternative. Some unincorporated areas within Carbon County are also expected to receive substantial impacts. Based on impacts from the applicants' projects, the incorporated portion of the Price CCD would have an increase over baseline in 2005 of 16 percent; with interrelated projects, the increase over baseline would be 45 percent.

TABLE 3-39
POPULATION IMPACTS
(Unitized Development Alternative)

	1980	1995	2005	1980	1995	2005
		Total Area of Influence			**Carbon County**	
Baseline Population	33,630	51,580	51,830	22,179	36,500	37,280
Applicants' Collective Impacts[a]		4,150	12,140		3,710	11,070
Percent Increase Over Baseline		8	23		10	30
Interrelated Projects		16,140	19,150		13,220	15,820
Cumulative Impacts		20,290	31,290		16,930	26,890
Percent Increase Over Baseline		39	60		46	72
Total Population	33,630	71,870	83,120	22,179	53,430	64,170
		East Carbon			**Sunnyside**	
Baseline Population	1,942	1,130	995	611	360	315
Applicants' Collective Impacts[a]		800	2,460		280	860
Percent Increase Over Baseline		71	247		78	273
Interrelated Projects		950	1,060		340	370
Cumulative Impacts		1,750	3,520		620	1,230
Percent Increase Over Baseline		155	354		172	390
Total Population	1,942	2,880	4,515	611	980	1,545
		Helper			**Unincorporated Areas of Helper CCD**	
Baseline Population	2,724	4,000	4,100	1,729	2,600	2,660
Applicants' Collective Impacts[a]		150	350		30	60
Percent Increase Over Baseline		4	9		1	2
Interrelated Projects		840	950		560	640
Cumulative Impacts		990	1,300		590	700
Percent Increase Over Baseline		25	32		23	26
Total Population	2,724	4,990	5,400	1,729	3,190	3,360
		Price			**Wellington**	
Baseline Population	9,086	17,700	18,500	1,406	2,800	2,800
Applicants' Collective Impacts[a]		1,550	4,650		430	1,290
Percent Increase Over Baseline		9	25		15	46
Interrelated Projects		6,850	8,320		1,890	2,310
Cumulative Impacts		8,400	12,970		2,320	3,600
Percent Increase Over Baseline		47	70		83	129
Total Population	9,086	26,100	31,470	1,406	5,120	6,400
		Unincorporated Areas of Price CCD			**Emery County**	
Baseline Population	4,327	7,500	7,500	11,451	15,080	14,550
Applicants' Collective Impacts[a]		400	1,220		440	1,070
Percent Increase Over Baseline		5	16		3	7
Interrelated Projects		1,790	2,180		2,920	3,330
Cumulative Impacts		2,190	3,400		3,360	4,400
Percent Increase Over Baseline		29	45		22	30
Total Population	4,327	9,690	10,900	11,451	18,440	18,950

TABLE 3-39 (Concluded)
POPULATION IMPACTS
(Unitized Development Alternative)

	1980	1995	2005	1980	1995	2005
		Castle Dale			**Cleveland**	
Baseline Population	1,910	3,000	2,850	522	620	600
Applicants' Collective Impacts[a]		110	290		20	50
Percent Increase Over Baseline		4	10		3	8
Interrelated Projects		700	820		120	140
Cumulative Impacts		810	1,110		140	190
Percent Increase Over Baseline		27	39		23	32
Total Population	1,910	3,810	3,960	522	760	790
		Elmo			**Huntington**	
Baseline Population	300	380	360	2,316	3,000	2,850
Applicants' Collective Impacts[a]		10	30		80	210
Percent Increase Over Baseline		3	8		3	7
Interrelated Projects		80	90		500	580
Cumulative Impacts		90	120		580	790
Percent Increase Over Baseline		24	33		19	28
Total Population	300	470	480	2,316	3,580	3,640
		Unincorporated Areas of Castle Dale-Huntington CCD			**Orangeville**	
Baseline Population	1,309	2,000	1,970	1,489	1,600	1,570
Applicants' Collective Impacts[a]		80	210		20	40
Percent Increase Over Baseline		4	11		1	3
Interrelated Projects		500	580		100	120
Cumulative Impacts		580	790		120	160
Percent Increase Over Baseline		29	40		8	10
Total Population	1,309	2,580	2,760	1,489	1,720	1,730
		Green River			**Unincorporated Areas of Green River CCD**	
Baseline Population	956	1,000	1,000	166	170	170
Applicants' Collective Impacts[a]		100	190		20	30
Percent Increase Over Baseline		10	19		12	18
Interrelated Projects		70	80		10	10
Cumulative Impacts		170	270		30	40
Percent Increase Over Baseline		17	27		18	24
Total Population	956	1,170	1,270	166	200	210

Note: CCD = Census County Division.

[a]Includes Chevron's interrelated project.

Table 3-40 presents employment for the affected counties. Employment statistics are not available for community level analysis. For the area of influence, total employment in 2005 is expected to increase by 22 percent over the baseline as a result of the applicants' proposals and 57 percent including interrelated projects.

Carbon County would have the greater increase in employment. In 2005, Carbon County employment would increase 30 percent over the baseline due to the applicants' projects, and would be 70 percent over the baseline with the interrelated projects included. Emery county would experience an insignificant employment growth from the applicants' projects, but its growth would rise to 28 percent with inclusion of the interrelated projects. Therefore, both counties would incur significant cumulative impacts, but only Carbon County would be significantly affected by the applicants' projects alone.

Personal Income

Because existing mining activity gives the area of influence a relatively high per capita personal income (PCPI), the unitized development alternative would not increase the PCPI level of the area significantly over the level projected for the baseline, either from the assumed tar sand development alone or when the interrelated projects are added.

The majority of personal income increases would occur in Carbon County. In 2005, 91 percent of total personal income increases would be in Carbon County as a result of the tar sand development. The cumulative impact increase would be slightly different, with 86 percent of the total personal income increase occurring in Carbon County.

The substantial increase in personal income for the area of influence of $1,089 million (1980 dollars) in 2005 would likely have significant effects on the cost of consumer goods and services and on the cost of

TABLE 3-40
EMPLOYMENT IMPACTS
(Unitized Development Alternative)

	1980	1995	2005	1980	1995	2005
		Total Area of Influence			**Carbon County**	
Baseline Employment	14,837	21,770	22,900	9,385	15,000	16,020
Applicants' Collective Impacts[a]		1,970	4,930		1,900	4,750
Percent Increase Over Baseline		9	22		13	30
Interrelated Projects		7,510	8,140		5,880	6,420
Cumulative Impacts		9,480	13,070		7,780	11,170
Percent Increase Over Baseline		44	57		52	70
Total Employment	14,837	31,250	35,970	9,385	22,780	27,190
		Emery County				
Baseline Employment	5,452	6,770	6,880			
Applicants Collective Impacts[a]		70	180			
Percent Increase Over Baseline		1	3			
Interrelated Projects		1,630	1,720			
Cumulative Impacts		1,700	1,900			
Percent Increase Over Baseline		25	28			
Total Employment	5,452	8,470	8,780			

[a]Includes Chevron's interrelated project.

housing. Significant local price inflation could result from local increased purchasing power. This would have an adverse effect on those with fixed incomes like the elderly and those who do not possess the skills to be employable in the higher income occupations.

Housing

The impacts of the unitized development alternative would seriously test the ability of the affected communities to provide adequate and affordable housing. Table 3-41 shows the additional household demand that would result from the applicants' proposed projects, the interrelated projects, and the cumulative effects from both. The 1980 column shows the total housing supply in that year. For the socioeconomic area of influence, the percentage increases over baseline would be 21 percent in 2005; with interrelated projects, increased housing demand would be 55 percent in 2005. Carbon County would experience the majority of the housing demand increases. Price would experience the greatest absolute housing demand increases of the communities included in the area of influence. Sunnyside, East Carbon, and Wellington, however, would experience the greatest housing demand increases compared to baseline. Using the significance criterion of 5 percent over baseline, all communities would be significantly affected. Increased housing demand would have a beneficial effect on the housing construction and finance industries. Nevertheless, limited housing supply would likely contribute to land speculation and increased housing costs in all of the significantly affected communities, with the possible exceptions of Cleveland, Elmo, and Green River.

Local Government Services and Facilities

These assessments of local government services and facilities are based on estimates derived from the technical report (Argonne National Laboratory 1983). The method used to derive the estimates is described in Appendix A-6, Socioeconomics.

Education

Significant increases in teachers and classrooms over projected baseline would be required in the area of influence under the unitized development alternative. Carbon County would be the most severely affected, having a demand for an additional 130 teachers and classrooms by 2005 as a result of the assumed tar sand development. This represents a 69 percent increase over the number required by baseline growth. With interrelated projects, the increase would be 325 teachers and classrooms, or 172 percent, by 2005. Emery County would not be significantly affected by the applicants' proposed projects alone, but would have a significant demand increase of 30 teachers and classrooms (49 percent) by 2005 with addition of the interrelated projects. Such large increases in classrooms would require the expansion of the school systems to at least equal this demand, since the baseline demand would eliminate any existing capacity.

Medical

All medical services and facilities would be severely affected under the unitized development alternative, because no additional capacity would be available to support the increased demand caused by the assumed tar sand development and the interrelated projects. Even under the baseline demand, there would be a need for additional physicians, dentists, and hospital beds by 1985. Carbon County would experience the most significant impacts, but Emery County could also be highly affected if its present lack of services continues to exist by that time. Under the unitized development alternative, the area of influence would have a demand for an additional 8 physicians and 6 dentists (67 percent and 60 percent respectively, over baseline demand) by 2005 as a result of the assumed tar sand development. Additional hospital beds would also be required, with a 48 percent increase in the socioeconomic area of influence by 2005. Addition of the interrelated projects would raise these needs to 22 physicians (183 percent increase), 16 dentists (160 percent increase), and 105 hospital beds (124 percent increase) by 2005.

Social and Mental Health Services

Understaffing and rising case loads presently affect the social and mental health services in the area of influence. It is estimated that an additional psychologist and 10 more social workers would be required as a result of baseline growth in the next 10 years (Walker 1983). Increased population caused by the applicants' proposed projects under the unitized development alternative and the interrelated projects would create a further need for 1 psychologist and 21 social workers by 2005.

TABLE 3-41
HOUSEHOLDS PROJECTIONS
(Unitized Development Alternative)

	1980[a]	1995	2005	1980	1995	2005
		Total Area of Influence			**Carbon County**	
Baseline Households	11,454	15,370	15,670	7,794	11,300	11,700
Applicants' Collective Impacts[b]		1,330	3,340		1,190	3,040
Percent Increase Over Baseline		9	21		11	26
Interrelated Projects		4,870	5,320		3,980	4,390
Cumulative Impacts		6,200	8,660		5,170	7,430
Percent Increase Over Baseline		40	55		62	64
Total Households	11,454	21,570	24,330	7,794	16,470	19,130
		East Carbon			**Sunnyside**	
Baseline Households	714	350	310	206	110	100
Applicants' Collective Impacts[b]		260	680		90	240
Percent Increase Over Baseline		74	219		82	240
Interrelated Projects		290	290		100	100
Cumulative Impacts		550	970		190	340
Percent Increase Over Baseline		157	313		173	340
Total Households	714	900	1,280	206	300	440
		Helper			**Unincorporated Areas of Helper CCD**	
Baseline Households	1,074	1,250	1,280	659	810	840
Applicants' Collective Impacts[b]		50	100		30	60
Percent Increase Over Baseline		4	8		4	7
Interrelated Projects		250	260		180	180
Cumulative Impacts		300	360		210	240
Percent Increase Over Baseline		24	28		26	29
Total Households	1,074	1,550	1,640	659	1,020	1,080
		Price			**Wellington**	
Baseline Households	3,195	5,470	5,790	433	860	900
Applicants' Collective Impacts[b]		500	1,280		140	350
Percent Increase Over Baseline		9	22		16	39
Interrelated Projects		2,070	2,310		580	640
Cumulative Impacts		2,570	3,590		720	990
Percent Increase Over Baseline		47	62		84	110
Total Households	3,195	8,040	9,380	433	1,580	1,890
		Unincorporated Areas of Price CCD			**Emery County**	
Baseline Households	1,365	2,320	2,350	3,660	4,070	3,970
Applicants' Collective Impacts[b]		130	330		140	300
Percent Increase Over Baseline		6	14		3	8
Interrelated Projects		540	600		890	930
Cumulative Impacts		670	930		1,030	1,230
Percent Increase Over Baseline		29	40		25	31
Total Households	1,365	2,990	3,280	3,660	5,100	5,200

TABLE 3-41 (Concluded)
HOUSEHOLDS PROJECTIONS
(Unitized Development Alternative)

	1980[a]	1995	2005	1980	1995	2005
		Castle Dale			**Cleveland**	
Baseline Households	622	800	780	156	170	160
Applicants' Collective Impacts[b]		40	80		5	10
Percent Increase Over Baseline		5	10		3	6
Interrelated Projects		210	220		40	40
Cumulative Impacts		250	300		45	50
Percent Increase Over Baseline		31	38		26	31
Total Households	622	1,050	1,080	156	215	210
		Elmo			**Huntington**	
Baseline Households	90	100	100	757	800	780
Applicants' Collective Impacts[b]		4	10		30	60
Percent Increase Over Baseline		4	10		4	8
Interrelated Projects		30	30		150	160
Cumulative Impacts		34	40		180	220
Percent Increase Over Baseline		34	40		22	28
Total Households	90	134	140	757	980	1,000
		Orangeville			**Unincorporated Areas of Castle Dale-Huntington CCD**	
Baseline Households	397	550	530	414	440	430
Applicants' Collective Impacts[b]		30	60		5	10
Percent Increase Over Baseline		5	11		1	2
Interrelated Projects		150	160		30	30
Cumulative Impacts		180	220		35	40
Percent Increase Over Baseline		33	42		8	9
Total Households	397	730	750	414	475	470
		Green River			**Unincorporated Areas of Green River CCD**	
Baseline Households	388	280	270	37	50	50
Applicants' Collective Impacts[b]		30	50		5	10
Percent Increase Over Baseline		11	19		10	20
Interrelated Projects		20	20		4	4
Cumulative Impacts		50	70		9	14
Percent Increase Over Baseline		18	26		18	28
Total Households	388	330	340	37	59	64

Note: CCD = Census County Division.
[a]Total available stock of year-round housing units.
[b]Includes Chevron's interrelated project.

Law Enforcement

Significant increases over baseline in demand for law officers and patrol cars would occur in the area of influence under the unitized development alternative. By 2005, Carbon County would have an increase in demand over baseline of 75 percent for law officers and patrol cars as a result of the assumed tar sand development and 182 percent with addition of the interrelated projects. Emery County's demands, while large in terms of percentage, would be small in number. Jail facilities would also have to be expanded, particularly in Carbon County where the facility is presently overcrowded.

Fire Protection

Additional fire equipment would likely be required in the area of influence, but available data does not allow numerical estimates. It is also likely that at least some of the communities would no longer be able to rely on volunteer fire departments.

Sewer

Sewage system capacity figures are not available for several of the communities. Of those that are available, the systems in Cleveland and Elmo and the combined Castle Dale-Orangeville system should be adequate for the cumulative population growth projected under the unitized development alternative. However, the system in Huntington would be overloaded by 1985, and the combined system of East Carbon and Sunnyside would exceed capacity by 2000. The combined system of Price, Helper, and Wellington is currently over design capacity. A planned expansion of the system to a capacity sufficient for 31,500 population would be used at full capacity by or before 2005.

Water

Increased demands for water in the area of influence resulting from the assumed tar sand development under the unitized development alternative would be significantly over the increases required under the baseline in both Carbon and Emery counties. Water demand in Carbon County, as measured by number of water system connections, would be increased 73 percent over baseline by 2005 from the assumed tar sand development, and 178 percent with the addition of the interrelated projects. In Emery County, the comparable increases would be 35 percent and 142 percent.

The available information on the community water systems indicates little or no excess capacity in terms of number of connections. In Carbon County, the Price water treatment plant's design capacity is considered well under peak demand, while the system serving East Carbon and Sunnyside obtains its water from the Grassy Trail Creek watershed and would be affected by the mining activity. Scofield Reservoir, the sole source of water for Wellington and the unincorporated area surrounding Price and Wellington, is currently being used at 50 to 60 percent of its capacity. In Emery County, the system that serves Cleveland, Elmo, Green River, Huntington, and Orangeville cannot accommodate new connections. The Castle Dale system's maximum number of connections would be exceeded in 1990.

Local Government Finances

Current financial data on the counties, communities, and other taxing districts in the area of influence are included under the proposed actions (Section 3.A.2, Socioeconomics). Additional fiscal information is provided in the socioeconomic technical report (Argonne National Laboratory 1983).

It is expected that severe fiscal pressure would result from the unitized development alternative unless mitigated by the applicants with some federal and state assistance. The rapid growth in population would cause immediate service demand increases. Revenues would lag initially, and coordinated mitigation planning, such as that required by Utah Senate Bill 170 and Carbon County Conditional Use Permit, would be necessary to avoid severe short-term service inadequacies.

Because demands on local infrastructure from baseline growth would equal or exceed their present capacities in many cases, the additional demands that would be imposed by the applicants' developments and the interrelated projects would require significant increases in capacity, particularly in Carbon County. Expansions would be needed in school classrooms, medical facilities, jails, and many of the water and sewer systems, and probably other facilities that were not included in this analysis. A majority of the additional capacity would be needed to meet the demands of the construction period, but

the largest part of the increased revenues from the developments would become available only after the buildup of mining operations. Also, those revenues would accrue largely to the counties, since the mines would be located in unincorporated areas, whereas much of the infrastructure costs would be borne by the communities.

Operating expenditures would be increased by needs for additional administrative and professional staff, greater demands on public safety and social welfare services, and the operation and maintenance costs of the expanded infrastructure.

Other Affected Industries

Hunting, Fishing, and Nonconsumptive Wildlife Use Expenditures

Under the unitized development alternative and using data supplied by the Utah Division of Wildlife Resources, the estimated increases in hunter expenditures in 1985 over 1980 in Carbon County would be about $537 under the collective scenario, while in 1995 it would be about $90,991. Increases in expenditures for nonconsumptive uses of wildlife in 1985 over 1980 for this area would be $612 and in 1995 would be $97,276.

This alternative under the cumulative scenario would increase hunting expenditures in 1985 over 1980 figures by an estimated $97,864 and $415,080 by 1995. Nonconsumptive uses of wildlife expenditures would increase $104,723 in 1985 and about $443,905 by 1995.

Quality of Life

The local social changes associated with the projected population growth could be significant under the unitized development alternative, particularly in East Carbon, Sunnyside, and Wellington. Those changes are described in detail in the proposed actions discussion (Section 3.A.2, Socioeconomics).

3.C.3 SOILS AND VEGETATION

Soils

Table 3-42 presents the acreages disturbed by soil groups.

Based on the analysis and the soils impact significance criteria, it is predicted that even though soil impacts would occur, through the use of the applicants' proposed reclamation procedures and the procedures that would be required by BLM (Appendix A-7), generally no significant impacts to soils would occur. However, some localized, very steep areas (about 5 to 8 percent of the area) resembling talus-like slopes with very low productive capacity, could remain in the reclaimed landscape. These areas would equate to the reconstruction occurrence of rock outcrop (canyon walls and escarpments) in extent and productivity. The mining disturbance and complete alteration of the existing soil profiles and landscapes would cause short-term losses of soil productivity and an increase in soil loss by erosion from wind and water during the period from initial disturbance until reclamation and the initial establishment of industry vegetation.

TABLE 3-42
ACRES OF SOIL GROUPS AFFECTED AND DISTURBED
(Unitized Development Alternative)

Type of Disturbance	Total Acres Disturbed[a]	Soil Group A1[b]	F	M1	M2	M3	MS1	MS2	MS3	Undetermined[c]
Collective Totals										
Leases[d]	28,800	376	339	626	3,120	1,804	184	11,952	10,399	0
Mine (Surface)	21,093	344	—	42	1,557	1,734	28	7,905	9,483	0
Plant and Spent Sand Disposal	6,407(267)	382	6,025	0	0	0	0	0	0	0
Plant and In-Situ Mining	6,000	22	274	478	1,294	6	130	3,307	489	0
Ancillary Facilities	2,445(415)	0	0	0	0	0	0	0	0	2,445
Total	35,945	748	6,299	520	2,851	1,740	158	11,212	9,972	2,445
Interrelated Projects Totals										
Mine (Surface)	1,400	0	0	0	0	118	0	1,223	59	0
Plant and Spent Sand Disposal	1,200(200)	0	1,200	0	0	0	0	0	0	0
Ancillary Facilities	300	0	0	0	0	0	0	0	0	300
Total	2,900	0	1,200	0	0	118	0	1,223	59	300
Cumulative Total										
Leases[d]	28,800	376	339	626	3,120	1,804	184	11,952	10,399	0
Mine (Surface)	22,493	344	0	42	1,557	1,858	28	9,128	9,542	0
Mine (In-Situ)	6,000	22	274	478	1,294	6	130	3,307	489	0
Plant & Spent Sand Disposal	7,607	382	7,225	0	0	0	0	0	0	0
Ancillary Facilities	2,745(615)	0	0	0	0	0	0	0	0	2,745
Total	38,845	748	7,225	520	2,851	1,858	158	12,435	10,031	2,745

Note: Figures shown in parentheses are acreages that would be removed (plant sites and roads) for the life of project. Land disturbance acreages also include areas disturbed outside the STSA, consisting mainly of plant sites and spent sand disposal areas.

[a]Total acres disturbed refers to total area that would be disturbed for life of project.

[b]Includes measured, delineated areas of flood plain soils; additional small areas not mappable due to map scale occur throughout the area of influence.

[c]Acreages not determined because locations of facilities are unknown at this time.

[d]Total lease area to be converted that is included in this alternative.

Vegetation

The estimated acreages of the different vegetation types that would be disturbed are shown in Table 3-43.

Based on the analysis and the vegetation impact significance criteria, some significant vegetation impacts could occur. The significance and acreage of impacts would depend on the success of the proposed reclamation programs (Appendix A-7).

Significant vegetative impacts could occur in the areas disturbed in the low precipitation zones (Climatic Zones B and C, Map 3-2, map pocket). These areas may not meet the significance criteria of establishing a ground cover within 5 years. Other significant vegetation impacts would relate to the criteria of not being able to restore the pre-project vegetation type diversity due to the changes in topography, slope, and aspect causing changes in microclimate conditions. These would include plants that require specialized micro-environmental conditions, mainly shrubs and trees. The aspen and conifer vegetation types consisting of 11,683 acres would be most strongly affected by surface mining operations. These vegetative impacts and changes would also effect wildlife (Section 3.A.4) and grazing (Section 3.A.9)

3.C.4 WILDLIFE

Under the unitized development alternative, impacts to wildlife habitat and populations would occur on an estimated 38,845 acres over a 94-year period (from initial disturbance through final revegetation). The effects of these disturbances would be the same as

TABLE 3-43
ACRES OF VEGETATION TYPES AFFECTED AND DISTURBED
(Unitized Development Alternative)

Type of Disturbance	Total Acres Disturbed[a]	Riparian[b]	Salt Shrub	Pinyon-Juniper	Sagebrush-Grass	Mountain Shrub	Aspen	Mixed Conifer	Undetermined[c]
Collective Totals									
Leases[d]	28,800	376	0	2,048	4,773	10,594	4,050	6,959	0
Mine (Surface)	21,093	344	0	659	1,982	8,303	3,552	6,253	0
Plant and Spent Sand Disposal	6,407(267)	232	0	5,180	183	812	0	0	0
Plant and In-Situ Mining	6,000	22	0	1,149	2,309	1,844	260	416	0
Ancillary Facilities	2,445(415)	0	0		0	0	0	0	2,445
Total	35,945	598	0	6,988	4,474	10,959	3,812	6,669	2,445
Interrelated Projects Totals									
Mine (Surface)	1,400	0	0	0	58	140	373	829	0
Plant and Spent Sand Disposal	1,200(200)	0	1,000	200	0	0	0	0	0
Ancillary Facilities	300	0	0	0	0	0	0	0	300
Total	2,900	0	1,000	200	58	140	373	829	300
Cumulative Total									
Leases[d]	28,800	376	0	2,048	4,773	10,594	4,050	6,919	0
Mine (Surface)	22,493	344	0	659	2,040	8,443	3,925	7,082	0
Mine (In-Situ)	6,000	22	0	1,149	2,309	1,844	260	416	0
Plant and Spent Sand Disposal	7,607(415)	232	1,000	5,380	183	812	0	0	0
Ancillary Facilities	2,745(615)	0	0	0	0	0	0	0	2,745
Total	38,845	598	1,000	7,188	4,532	11,099	4,185	7,498	2,745

Note: Figures shown in parentheses are acreages that would be removed (plant sites and roads) for life of project. Land disturbance acreages also include areas disturbed outside the STSA, consisting mainly of plant sites and spent sand disposal areas.

[a]Total acres disturbed refers to total area that would be disturbed for life of project.

[b]Includes measured, delineated areas of flood plain soils; additional small areas not mappable due to map scale occur throughout the area of influence.

[c]Acreage not determined because locations of facilities are unknown at this time.

[d]Total area to be converted that is included in this alternative.

those discussed for the proposed actions (Section 3.A.4, Wildlife). This corresponds to about 38 percent of the wildlife habitat in the main block of the STSA.

The habitat disturbance would occur progressively over the 94 years, as shown on Figure 2-1 (Chapter 2). The number of acres disturbed at one time would increase gradually for about 25 years until steady-state, full production is achieved. Then, for a period of about 60 years, about 3,500 acres would be disturbed at any one time. During the final 9 years, disturbance would taper rapidly.

Construction of right-of-way facilities would temporarily disturb an estimated 2,745 acres of land for approximately 1 to 2 years of which 2,445 acres would be caused by the 5 applicants on the proposed conversion areas.

Surface mining and in-situ recovery activities would disturb an estimated 27,093 acres of the 28,800 acres proposed for conversion.

Land disturbance associated with the spent sand disposal areas would occur on a total of 7,140 acres, of which 6,140 acres would be caused by the mining activities associated with the proposed lease conversions. The spent sand disposal for the unitized alternative is assumed to be split between 2 locations—a 3,500-acre area southwest of Sunnyside (Climatic Zone B, Map 3-2, map pocket) and a 3,640-acres area northwest of Sunnyside (Climatic Zone C, Map 3-2, map pocket).

3.C.5 RECREATION RESOURCES

The unitized development alternative would cause the same types of impacts to the recreation resource and quality of the user experiences as discussed for

the proposed actions (Section 3.A.5, Recreation Resources). Over the 94-year life of the unitized development alternative, approximately 38,845 acres would be disturbed. At any one time, approximately 3,500 acres would be eliminated from dispersed recreation opportunities such as sightseeing, hunting, camping, and off-road vehicle use.

Based upon the number of acres to be disturbed at any one time and the projected population increases in Carbon and Emery Counties, impacts upon the quality of sightseeing and dispersed camping, especially in the Bruin Point area, would be adversely affected. Primary access routes to favorite recreation areas would be altered or eliminated.

Impacts to hunting opportunities and quality experiences would be anticipated due to the population growth that would accompany the assumed tar sand development and the reductions in habitat that would result from the mining and in-situ recovery activities. Small concentrations of deer populations likely would be affected (Section 3.C.4, Wildlife).

Hiking and backpacking opportunities would be affected by the land disturbing activities. The quality of these types of passive recreation experiences would be affected by the noise and visual intrusions of mining and in-situ recovery activities.

3.C.6 VISUAL RESOURCES

Significant impacts to the visual resource would occur if the converted leases were to be developed as assumed for the unitized development alternative. Approximately 20,332 acres of land classified as VRM Class II would be significantly changed, as would 7,268 acres of Class III land and 5,250 acres of Class IV land. The impacts due to disturbance of 2,445 acres at unknown locations (acreage required for ancillary facilities) cannot be determined. See Table 3-44 for a more detailed summary of visual resource impacts.

Although the duration of mining activities has been defined and vegetative rehabilitation would occur for most areas within the operational period of the project, the landform impacts introduced to the existing landscape would remain for the long term. The essentially permanent nature of the landform modifications as a result of this alternative would not be restored to the present condition to blend with portions of the natural landscape. The background created by the higher landforms of the STSA would be removed, therefore significantly and, for all purposes, permanently modifying the visual character of the region. Additionally, vegetation contrasts would be extensive for surface mining and in-situ extractions, because the time needed for adequate revegetation to reduce the visual contrast to a satisfactory level would remain long-term. Landform and vegetation impacts created by spent sand disposal and the addition of new structures at the plant sites would, likewise, be long-term under this alternative. Only upon complete revegetation and removal of visually dominant structures would the significant pacts become acceptable.

TABLE 3-44
SUMMARY OF VISUAL RESOURCE EXISTING CONDITIONS AND SIGNIFICANT IMPACTS (ACRES)
(Unitized Development Alternative)

Component	VRM Class II[a] Existing[b]	VRM Class II[a] Significantly Affected[c]	VRM Class III[a] Existing[b]	VRM Class III[a] Significantly Affected[c]	VRM Class IV[a] Existing[b]	VRM Class IV[a] Significantly Affected[c]	VRM Class IV[a] Undetermined[d]
Mines	17,568	17,568	975	975	3,950	3,950	0
Plants	1,139	1,139	3,528	3,528	1,800	300	0
Spent Sand Disposal Areas	1,625	1,625	3,515	2,765	2,000	1,000	0
Ancillary Facilities	—	—	—	—	—	—	2,445
Total Impacts	20,332	20,332	8,018	7,268	7,750	5,250	2,445

[a]Refer to Appendix A-9, Visual Resource Management Methodology, for definitions of VRM classes.
[b]Acres of existing VRM class in conversion areas included in the partial conversion alternative.
[c]Acres that would be significantly affected as defined in Section 3.A.6, Impact Significance Criteria.
[d]Indicates the acreages that would be required for ancillary facilities whose specific locations and impacts are unknown at this time.

3.C.7 AIR QUALITY

Table 3-45 lists the unitized development alternative concentration values compared to the National Ambient Air Quality Standards (NAAQS) and year 2005 estimated background levels of the receptors showing the highest concentration.

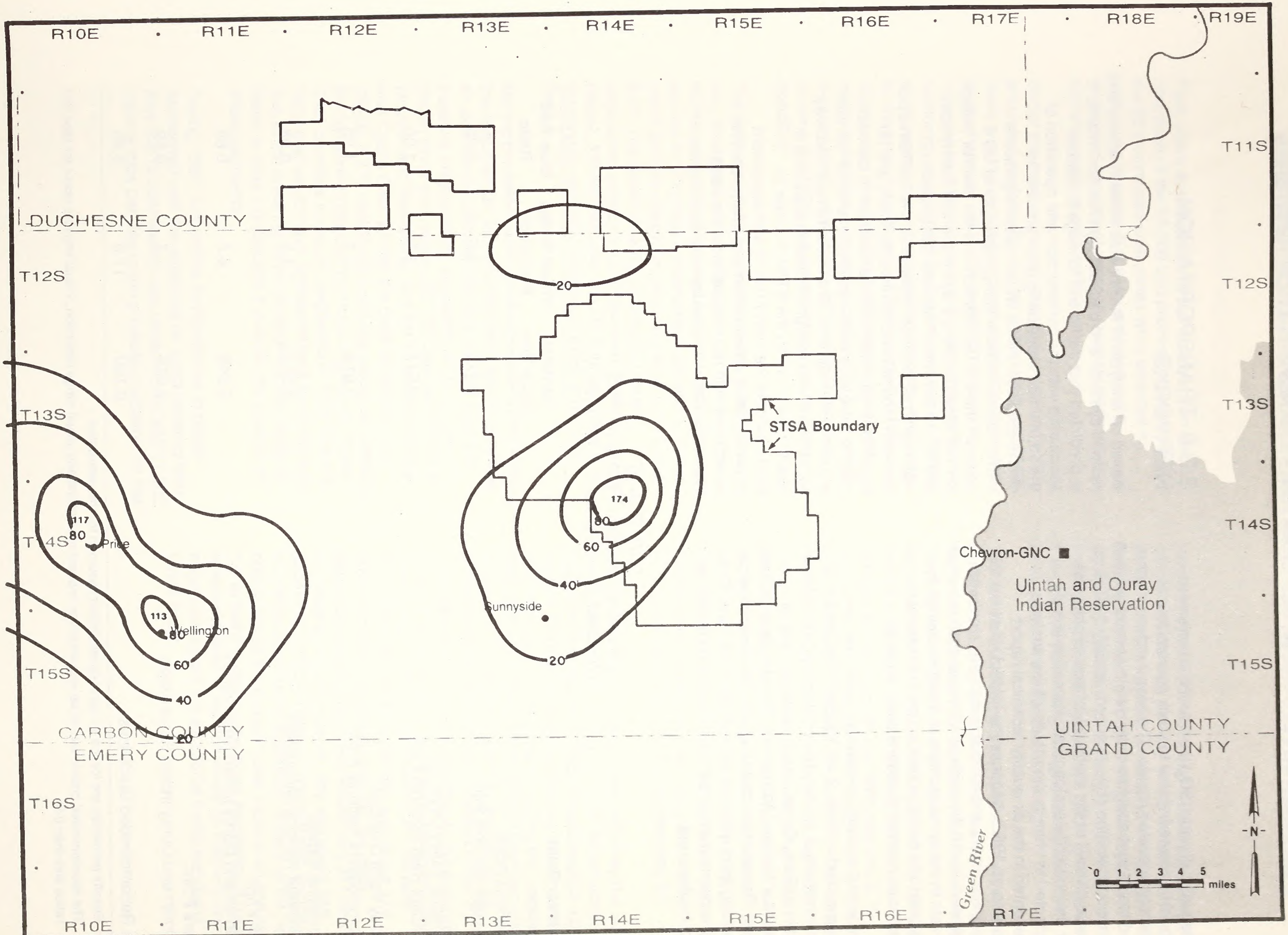
The total suspended particulate (TSP) NAAQS is expected to be exceeded, as shown in Map 3-11. Prevention of Significant Deterioration (PSD) Class II increments would be exceeded for TSP over a large area due to surface mining activities. No known fugitive dust control measures are sufficient to fully mitigate the TSP impacts.

TABLE 3-45
MAXIMUM SO_2, TSP, AND NO_2 CONCENTRATIONS
(Unitized Development Alternative)

Areas of Special Concern	Maximum Average Concentrations ($\mu g/m^3$) SO_2 3-hour	SO_2 24-hour	SO_2 Annual	TSP 24-hour	TSP Annual	NO_2 Annual
NAAQS	1300	365	80	150	60	100
Class II Areas PSD Class II Increment	512	91	20	37	19	NA
Areas Near Sunnyside STSA Impacts	312(18)	120(7)	12(1)	596(148)	149(40)	63(2)
Uintah and Ouray Indian Reservation Impacts	8(18)	2(7)	<1(1)	<1(148)	<1(40)	<1(2)

Note: Selection of a different grid origin could result in slightly different maximum concentrations and locations of those maximum due to the terrain variability.

Figures in parentheses represent 2005 Baseline Source Concentrations.



MAP 3-11 ANNUAL TSP CONCENTRATIONS (ug/m^3)
(Unitized Development Alternative)

The sulfur dioxide (SO_2) 24-hour PSD increment would be exceeded due to stack gas emissions affecting elevated terrain. The area involved is small and the impact could be mitigated in several ways. A proposed location change approximately 5 miles to the southwest of the modeled proposed plant site for the unitized development alternative is not expected to change the results of the analysis presented in the air quality technical report (Aerocomp 1983), because the impacts that are the most significant and difficult to mitigate are those associated with the surface mining operations which remain in the same location. A location change for the plant site could, in fact, be part of mitigation measures needed to reduce stack impacts.

The level 2 visibility screening results are summarized in Table 3-46. Visibility impairment is not expected at Arches National Park, Capitol Reef National Park, Canyonlands National Park, or Dinosaur National Monument. The Uintah and Ouray Indian Reservation could experience visual impacts resulting from nitrogen oxide (NO_x) emissions. That is, the plume may be perceptible against the sky or light background.

3.C.8 TRANSPORTATION NETWORKS

Based on analysis of the impacts to the roadway and railroad systems and the pact significance criteria, it is predicted that traffic and tonnage increases associated with the construction and operation of the 50,000 bpd processing plant and the 20 interrelated coal mines would cause significant traffic-related impacts along segments of US 6 between the SR 123 junction and the town of Helper, SR 123 between the US 6 junction and Sunnyside, and SR 10 between Price and Castle Dale; (2) significant rail tonnage impacts on the D&RGW spur between Mounds and Sunnyside, Utah; and (3) significant road maintenance because of the traffic volume increases even though the level-of- service would not change; and (4) a need for new roadway construction and realignment and upgrading of specific roads within the STSA in order to accommodate the heavy trucks and equipment required during construction and operation. This would have significant impacts on the visual resources, and would cause land disturbance.

TABLE 3-46
LEVEL 2 VISIBILITY ANALYSIS
(Unitized Development Alternative)

Observer Point Location	Contrast Reduction	Visual Range Reduction	Blue-Red Ratio
Panorama Point Arches National Park	0.019	1.8	0.99
Cathedral Valley Overlook Capitol Reef National Park	0.017	1.6	1.00
Murray Point Overlook Canyonlands National Park	0.018	1.7	1.00
Moonshine Rapids Dinosaur National Monument	0.014	1.3	0.98
Buck Knoll Uintah and Ouray Indian Reservation	0.048	4.7	0.88
Peters Point Uintah and Ouray Indian Reservation	0.018	1.7	0.89
EPA Recommended Guidelines	0.100	11.0	0.90

Note: Results presented are for the tar sand development assumed for this alternative.
The recommended criteria has to be exceeded for impacts to contrast and visual range reduction. Visual impacts occur for blue-red ratios less than 0.9.

Peak years associated with the construction and operation of the 50,000 bpd processing plant and the 20 interrelated coal mines were selected for evaluating impacts. Capacity analyses were completed for annual average monthly traffic and monthly average daily traffic.

Under the maximum peak demand condition for the projected peak traffic volume years (1995 and 2003), there would be road segments operating below the level-of-service of C. This is based on service volumes for level-of-service C and computed from standards established by the American Association of Highways and transportation officials, and used by the Utah Department of Transportation (UDOT) as a design standard for rural minor arterial and major collectors. According to the UDOT, the 1982 existing traffic operations and roadway facilities serving the STSA are generally in a stable flow condition.

The projected baseline estimates, vehicle trips per day, total peak vehicle trips per day, precentage increase over the projected baseline and the level of service for the peak construction-operation overlap years and the operation years are shown on Table 3-47. The table includes 16 specific roadway segments located on US 6 between Green River and Helper, SR 123 between the US 6 junction and Sunnyside, and SR 10 between Price and Castle Dale.

During the peak construction-operation year (1995), the assumed tar sand development would generate an additional 2,290 vehicle trips per day over the baseline projection for segments of US 6 between Green River and Helper, SR 123 between the US 6 junction and Sunnyside, and SR 10 between Price and Castle Dale. During the peak operation year (2003), 5,770 vehicle trips per day would be added to the baseline projection for these segments. Table 3-47 identifies 4 specific segments in 1995 and 9 in 2003 that would have significant long-term impacts, due to the lowering of the level-of-service below C. Refer to Map 1-3 (Section 1.A.5) for the location of these segments.

During 1995, cumulative traffic volume impacts associated with the assumed tar sand development plus the 16 interrelated coal mines would add 11,002 vehicle trips per day to the projected baseline for the roadway system (US 6, 10 and 123). During 2003, 14,282 vehicle trips per day would be added. This would increase impacts associated with the tar sand development alone by extending the impacts to additional specific roadway segments on SR 10 between Price and Castle Dale. Table 3-47 identifies 9 segments that would be significantly affected (level-of-service would be below C).

The vehicle accident rate per million vehicle miles traveled on US 6 between Soldier Summit and Green River for 1982 was 1.22 accidents per million vehicle miles, which is less than the State of Utah's expected rate of 2.06 accidents per million vehicle miles for this type of road. On SR 123 between US 6 junction and Sunnyside, the 1982 rate was 0.75 accidents per million vehicle miles, which is less than the 2.88 accidents expected; and on SR 10 between Price and Castle Dale, the 1982 rate was 1.29 accidents per million vehicle miles, which also is less than the expected rate of 2.02. The number of traffic accidents per million vehicle miles traveled in 1982 on US 6 between Soldier Summit and Green River was 166, the number for SR 123 between US 6 junction and Sunnyside was 6, and the number for SR 10 between Price and Castle Dale was 64.

The additional traffic associated with only the tar sand development during the peak construction-operation overlap year (1995) would result in a 0.51 percent increase in vehicle trips per day and about 41 additional traffic accidents; during the peak operation year (2003), there would be a 0.66 percent increase in vehicle trips per day and about 53 additional traffic accidents. Considering the 20 interrelated coal mines in addition to the assumed tar sand development, the construction-operation overlap year (1995) would have a 217 percent increase in vehicle trips per day and about 174 additional traffic accidents; during the peak operation year (2003), there would be a 311 percent increase in vehicle trips per day and about 248 additional traffic accidents. These traffic accident increases would be a significant impact to the health and safety of the traveler. See Table 3-47 and Map 1-3 to identify and locate those segments of road where the level of service would be below C and the segments where the additional traffic accidents could occur.

TABLE 3-47
PROJECTED HIGHWAY ANNUAL AVERAGE MONTHLY TRAFFIC
(Unitized Development Alternative)

	COLLECTIVE IMPACTS													
			Construction-Operation Overlap Impacts						Operation Impacts					
Road Segment	Traffic Control Point Location[a]	1989 Level-of-Service Baseline[c]	Projected 1989 Baseline Estimate (VTPD)[b]	1989 Applicant-Related Increase (VTPD)	Total Peak (VTPD)	Percent Increase Over Projected Baseline	Level-of-Service Projected Baseline[c]	2003 Level-of-Service Baseline[c]	Projected 2003 Baseline Estimate (VTPD)[a]	2003 Applicant Related Increase (VTPD)	Total Peak VTPD	Percent Increase Projected Baseline	Level-of-Service Projected Baseline[c]
US 6													
Junction SR J39	1	C	13,566	140	13,706	1	C	C	14,690	280	14,970	2	C
FAS 298 (old road) SR 55 West of Price	2	B	8,753	190	8,943	2	C	B	9,478	280	9,759	3	C
Bypass Road S of Price	3	B	10,100	365	10,465	4	C	B	10,936	670	11,605	6	C
West Incl. Wellington	4	C	7,372	1,240	8,612	17	D	C	7,982	2,790	10,772	35	D
East Incl. Wellington	5	B	5,021	1,480	6,501	29	C	B	5,437	3,380	8,817	62	D
Woodside-FAI 70 West of Green River	6	B	2,765	60	2,825	2	B	B	2,994	95	3,089	3	B
SR 123													
Junction US 6	7	B	2,914	1,700	4,614	58	C	B	3,155	4,035	7,190	128	C
Junction SR 124	8	C	4,325	2,135	6,460	49	D	C	4,783	5,170	9,953	108	F
South Incl. Sunnyside-North Incl. Sunnyside	9	B	2,160	2,290	4,450	106	C	B	2,338	5,570	7,908	238	E
SR 10													
East Incl. Castle Dale	10	C	3,687	65	3,752	2	C	C	3,993	140	4,133	4	C
Junction SR 29	11	D	5,688	65	5,753	1	C	D	6,159	140	6,299	2	D
South Incl. Huntington	12	D	7,290	110	7,400	2	D	D	7,894	235	8,129	3	E
Junction SR 155 Road to Elmo	13	C	4,162	160	4,322	4	C	C	4,508	375	4,883	8	C
Carbon/Emery County Line	14	C	4,163	165	4,328	4	C	C	4,508	380	4,888	8	C
Junction SR 122	15	C	4,326	170	4,496	4	C	C	4,684	385	5,069	8	C
Price South Incl. Price	16	D	7,165	175	7,340	2	D	D	7,759	390	8,149	5	D

TABLE 3-47 (Concluded)
PROJECTED HIGHWAY ANNUAL AVERAGE MONTHLY TRAFFIC
(Unitized Development Alternative)

			CUMULATIVE IMPACTS											
			Construction-Operation Overlap Impacts						Operation Impacts					
Road Segment	Traffic Control Point Location[a]	1989 Level-of-Service Baseline[c]	Projected 1989 Baseline Estimate (VTPD)[b]	1989 Applicant-Releted Increase (VTPD)	Total Peak (VTPD)	Percent Increase Over Projected Baseline	Level-of-Service Projected Baseline[c]	2003 Level-of-Service Baseline[c]	Projected 2003 Baseline Estimate (VTPD)[a]	2003 Applicant Related Increase (VTPD)	Total Peak VTPD	Percent Increase Projected Baseline	Level-of-Service Projected Baseline[c]
US 6													
Junction SR J39	1	C	13,566	910	14,476	7	C	C	14,690	980	15,670	7	C
FAS 298 (old road) SR 55 West of Price	2	B	8,753	1,690	10,443	19	C	B	9,478	1,530	11,009	16	C
Bypass Road S of Price	3	B	10,100	4,860	14,960	48	C	B	10,936	4,970	15,906	45	C
West Incl. Wellington	4	C	7,372	4,135	11,507	56	E	C	7,982	5,610	13,592	70	E
East Incl. Wellington	5	B	5,021	3,340	8,361	66	C	B	5,437	5,170	10,607	95	D
Woodside-FAI 70 West of Green River	6	B	2,765	110	2,875	4	B	B	2,994	140	3,134	5	B
SR 123													
Junction US 6	7	B	2,914	2,545	5,459	87	C	B	3,155	4,790	3,134	5	C
Junction SR 124	8	C	4,325	2,350	6,675	54	D	C	4,783	5,370	10,153	112	F
South Incl. Sunnyside-North Incl. Sunnyside	9	B	2,160	2,510	4,670	116	C	B	2,338	5,770	8,108	246	D
SR 10													
East Incl. Castle Dale	10	C	3,687	760	4,438	20	C	C	3,993	905	4,898	23	C
Junction SR 29	11	D	5,688	760	6,448	13	D	D	6,159	1,160	7,319	19	D
South Incl. Huntington	12	D	7,290	1,275	8,565	17	E	D	7,894	1,510	9,404	19	E
Junction SR 155 Road to Elmo	13	C	4,162	1,425	5,587	34	D	C	4,508	1,760	6,268	39	D
Carbon/Emery County Line	14	C	4,163	1,455	5,618	34	C	C	4,508	1,770	6,278	39	C
Junction SR 122	15	C	4,326	1,470	5,796	34	D	C	4,684	1,790	6,474	38	D
Price South Incl. Price	16	D	7,165	1,490	8,655	21	E	D	7,757	1,810	9,569	23	E

Note: VTPD = vehicle trips per day; Incl. = including.

[a]Refers to locations shown on Map 1-3.

[b]Projected 1981 highway traffic volume for US 6, SR 123 and SR 10 by one percent compounded.

[c]American Association State Highway and Transportation (1965) Levels-of-Service. A=free traffic flow, accompanied by low volumes and high speeds; B=stable traffic flow, with operating speeds beginning to be restricted by traffic conditions; C=stable traffic flow, but drivers are restricted in their freedom to select speed, change lanes, or pass; D=approaches unstable traffic flow, with fluctuations in volume and temporary restrictions to flow, which may cause substantial drops in operating speeds; E=unstable traffic flow, with momentary stoppages; F=forced traffic flow, with low speeds and short or long stoppages because of downstream congestion. Level-of-Service = Baseline x factor (Volume Per Hour) - factor (Volume Capacity Ratio and calculated on a highway speed of 60 mph under interrupted flow conditions).

Rail System

When added to the present 3.2 million gross tons per year, the rail tonnage associated with the 50,000 bpd tar sand processing plant (1.4 million tons), and the 3 interrelated coal mines within the Sunnyside area (7.2 million tons), would exceed the 5 million gross tons per year capacity of the D&RGW railroad spur from Mounds to Sunnyside. Assuming the worst case, one-half of the 50,000 bpd or 25,000 bpd would be shipped by rail from Sunnyside. The 25,000 bpd would equate to 1.4 million gross tons per year, which would require loading 46 85-ton railroad tank cars per day. This would be approximately one 84-car unit train every two days, or a 4-unit train in and out of Sunnyside every 4 days. This could have a significant long-term impact on the rail spur.

Locating adequate land space for construction of speed loading facilities for the rail tank cars and storage for the minimum of one 84-unit train at one time would not be a problem, because the processing plant would be located next to Kaiser's rail storage year. There could be a congestion impact when the 84-unit coal train from the coal mines passes through Sunnyside. Because there also would be an additional added impact when the 100-unit coal train from the coal mines passes through Sunnyside and when coal cars are stored in the Kaiser's rail storage yard.

Public Transportation

The significant impact is based on the total population within the affected area for 2005 (83,100 people). This conceivably could cause a significant positive impact, because it could enable the Price and Sunnyside airports to support commercial flights.

Under the unitized development alternative, there would be no significant mpacts to passenger rail or bus service. However, along US 6, population increases could provide the impetus to establish service on SR 10 to the towns of Huntington, Cleveland, Elmo, Orangeville, and Castle Dale.

3.C.9 AGRICULTURE

Grazing disturbance associated with the unitized development alternative would cause a loss of 344 AUMs of forage per year, which equates to a reduction of approximately 86 head of livestock (cattle) annually based on a 4-month grazing season. Of this total, 322 AUMs of forage lost per year would be caused by activities of the 5 applicants on the proposed conversion areas, which equates to a reduction of approximately 80 head of livestock. Table 3- 48 identifies the number of operators, allotments, and the percentage of each allotment affected.

This alternative would affect 5 allotments and possibly an additional one whose specific location is undetermined. Disturbance to grazing would occur over a period of approximately 94 years.

Impact to individual ranch operations possibly would be minimized, providing mining activities are planned and conducted in a manner that permits a minimum of grazing disruption at any one time and allows areas to be grazed effectively, concurrent with mining operations. This alternative could allow for more effective utilization of the forage produced in the area during the mining period. However, due to the type and steepness of terrain within the area, a very intensive mining-grazing program would be required to ensure grazing access and adequate livestock water and water distribution and to effectively utilize available forage on the undisturbed lands and those reclaimed with vegetation established sufficiently for grazing.

Impacts to grazing caused by population increases such as disturbance (molestation) of grazing animals, increased vandalism of fences and range facilities, and livestock road kills would be reduced due to the small population increase associated with this alternative.

Refer to the proposed actions analysis (Section 3.A.9. Agriculture) for a detailed discussion of the nature of the grazing impacts that would result from surface mining, spent sand disposal, and in site recovery. Refer to Map 1-3 for identification of grazing allotment boundaries and names.

Cropland

No cropland occurs within the STSA area. However, cropland losses are anticipated due to population expansion (Section 3.A.9, Agriculture). Project-related population increases due to mining activities proposed by the 5 applicants would cause the

TABLE 3-48
GRAZING ALLOTMENTS AFFECTED AND GRAZING LOSSES CAUSED BY UNITIZED DEVELOPMENT ALTERNATIVE

Allotment Name and Number	Number of Operators	CURRENT STATUS Acreage Public	Total	POTENTIAL GRAZING LOSSES (AUMs)[a] Active Reference (AUMs)	Total	Percent of Allotment
Cow Canyon (4032)	4	2,145	—	71 (30 Ac/AUM)	54 (6)	76 (6)
Dry Canyon (4038)	1	14,805	20,680	890 (17 Ac/AUM)	435 (65)	49 (7)
Green River North (4049)	1	122,945	166,621	8,584 (14 Ac/AUM)	502 (75)	6 (0.1)
Sheep Canyon (4103)	7	9,170	18,302	696 (13 Ac/AUM)	531 (79)	76 (11)
Stone Cabin (4109)	2	23,014	30,518	1,625 (14 Ac/AUM)	116 (17)	7 (1)
Icelander (4056)	1	40,008	46,788	2,691 (14 Ac/AUM)		
Outside[b]	2	—	—	NA (16 Ac/AUM)	192 (34)	NA NA
Undetermined[c]	—	—	—	NA (13 Ac/AUM)	461 (68)	NA NA
Total AUMs Lost/Year					(344)	

Note: AUM = animal unit month; AC/AUM = acres per animal unit month; NA = not applicable.

[a]Figures without parentheses represent forage production (AUMs) per year for the entire proposed conversion area or area affected. Figures enclosed by parentheses represent average forage production (AUMs) lost per year due to mining activities based on 5-year reclamation schedule (with exception of Amoco).

[b]Grazing parcels outside of named allotment boundaries.

[c]Area assumed to be in the Mud Springs and Icelander grazing allotments, to determine AUMs.

conversion of an estimated 1,439 acres of land to homesites and other related support facilities in the area of Price, Wellington, and Sunnyside. It is estimated that approximately 475 acres of cropland would be converted to urban uses. This would be an insignificant impact based on the impact analysis and cropland signficance criteria.

3.C.10 CULTURAL RESOURCES

The impacts of this alternative on cultural resources would be the same as those described for the proposed actions (Section 3.A.10, Cultural Resources).

3.C.11 PALEONTOLOGY AND MINERAL RESOURCES

The impacts of this alternative would be the same as those described for the proposed actions (Section 3.A-11, Paleontology and Mineral Resources).

3.C.12 WILDERNESS RESOURCES

No direct impacts would occur to either the Turtle Canyon and Desolation Canyon Wilderness Study Areas (WSAs), or the Jack Canyon Appeal Area, because none of the conversion areas or related facilities included in this alternative overlie these unit boundaries.

In general, the types of secondary impacts to the wilderness resources of these units and impacts to the quality of the wilderness user experiences would be the same as those described for the proposed actions (Section 3.A.12, Wilderness Resources). However, since commercial operations would continue over a 60-year period, 3,500 acres of the resource land base would be disturbed at any one time; therefore impacts to wilderness characteristics (the naturalness, and solitude) in the units would be minimal. However, plumes from the tar sand processing plant could be perceptible against the sky or light background due to nitrous oxides along the northern portion of the Desolation Canyon WSA and Jack Canyon Appeal Area (Section 3.A.7, Air Quality).

Population increases in the local area would minimally affect solitude experiences and the frequency of user conflicts.

3.C.13 CONFLICTS WITH LAND USE PLANS, POLICIES, AND CONSTRAINTS

There would be no conflicts with existing land use plans or controls due to implementation of the unitized development alternative other than those associated with the special watershed management areas as discussed for the proposed actions (Section 3.A.13, Conflicts with Land Use Plans, Policies, and Constraints).

3.D NO ACTION ALTERNATIVE

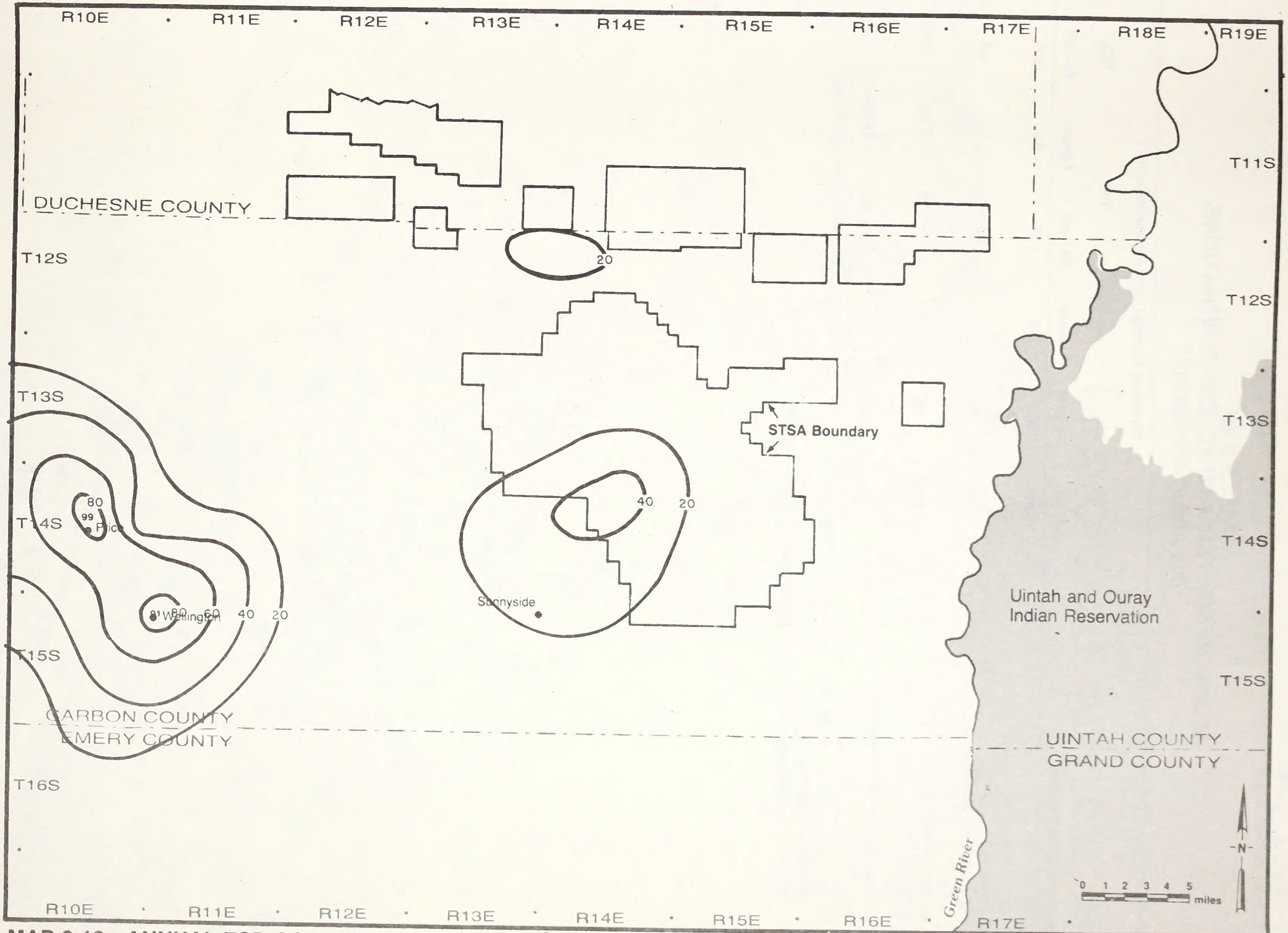
Under the no action alternative, the proposed lease conversions would be denied, which would result in the termination of a majority of the oil and gas leases in question. It is assumed that development of the interrelated projects would proceed (Chevron's interrelated tar sand project and 16 interrelated coal mines). Therefore, the analysis of this alternative considers the impacts would occur assuming denial of the conversions (future baseline conditions) plus development of the interrelated projects.

With the exception of air quality, the impacts of the no action alternative correspond directly with the impacts of the interrelated projects identified in the proposed actions impact analysis (Section 3.A, Proposed Actions). Under this alternative, there would be no impacts to federal land within the Sunnyside STSA.

The no action alternative emissions inventory includes the county-wide emission sources from the 1981 inventory increased proportionally by the expected population growth plus the direct emissions and secondary growth emissions from a tar sand surface mine and a 10,000 barrel per day (bpd) plant facility.

Map 3-12 shows the expected annual total suspended particulate (TSP) levels for the no action alternative. As shown, the area near Price and Wellington is expected to be above the National Ambient Air Quality Standards (NAAQS). A small area centered on the projected tar sand surface mine is also expected to be above the NAAQS. The TSP impacts of the surface mine are 39 micrograms per cubic meter ($\mu g/m^3$) for an annual average and 154 $\mu g/m^3$ for the 24-hour maximum, as shown in Table 3-49. These values are added to the impacts for the baseline sources to yield a maximum predicted total impact of 79 $\mu g/m^3$ for the annual and 322 $\mu g/m^3$ for the 24-hour maximum. In the Price area, the estimated maximum TSP receptor has an annual average value of 118 $\mu g/m^3$ and a 24-hour value of 458 $\mu g/m^3$, due only to the population growth, which is expected to double.

Should conversion of the leases be denied, the purposes of the proposed actions would not be achieved. Similarly, the national goal to reduce dependence on foreign oil sources would be harder to achieve without the production of oil from tar sand.



MAP 3-12 ANNUAL TSP CONCENTRATIONS (ug-m^3)
(No Action Alternatives)

TABLE 3-49
MAXIMUM SO_2, TSP, AND NO_2 CONCENTRATIONS
(No Action Alternative)

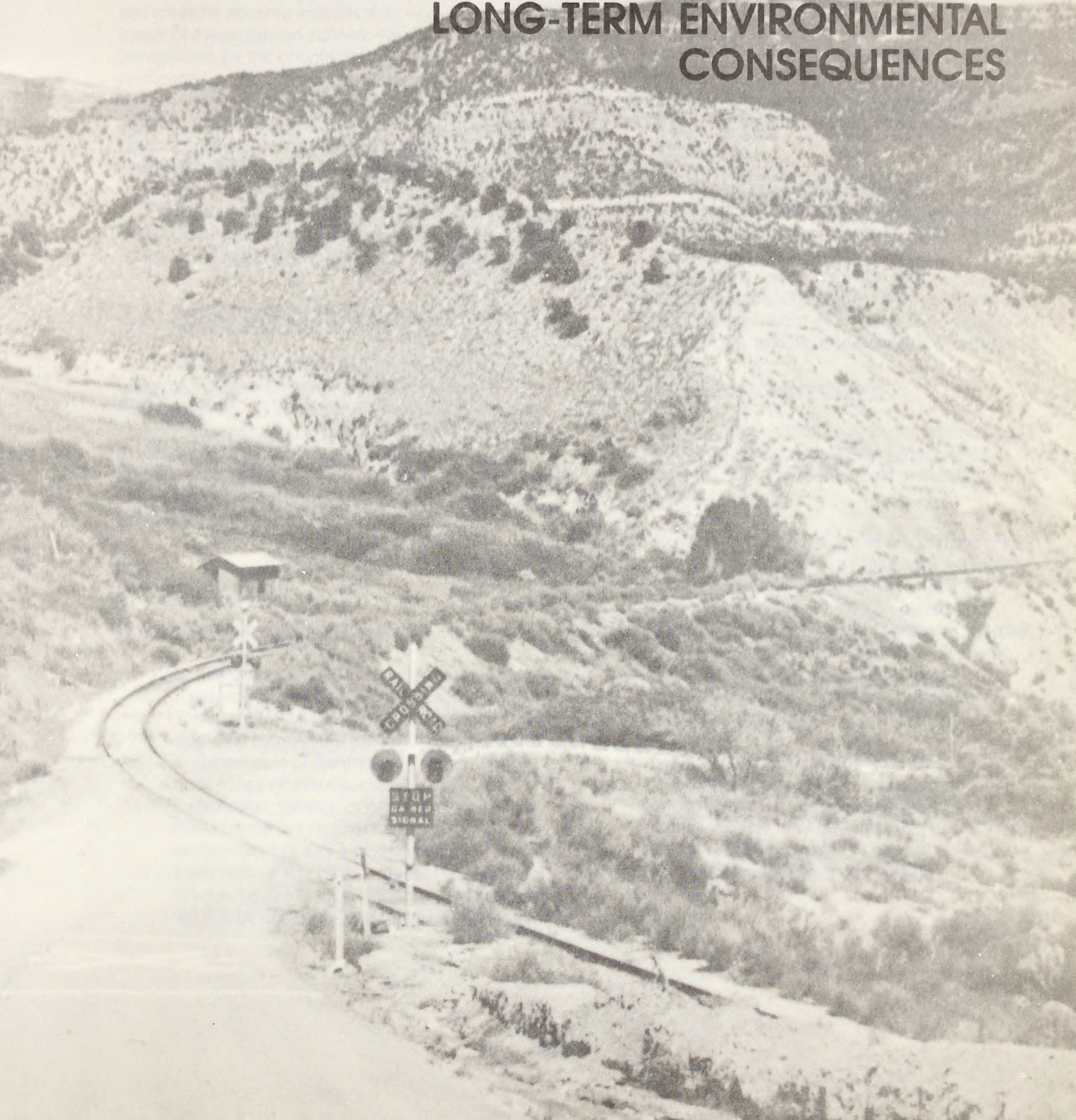
	Maximum Average Concentrations ($\mu g/m^3$)					
	SO_2			TSP		NO_2
Areas of Special Concern	**3-hour**	**24-hour**	**Annual**	**24-hour**	**Annual**	**Annual**
NAAQS	1300	365	80	150	60	100
Class II Areas						
PSD Class II Increment	512	91	20	37	19	NA
Areas Near Sunnyside STSA						
Impacts	126(18)	35(7)	3(1)	154(148)	39(40)	49(2)
Uintah and Ouray Indian Reservation						
Impacts	2(18)	1(7)	1(1)	1(148)	1(40)	1(2)

Note: Selection of a different grid origin could result in slightly different maximum concentrations and locations of those maximum due to the terrain variability.

Figures in parentheses represent 2005 Baseline Source Concentrations.

CHAPTER 4

MONITORING AND UNAVOIDABLE, ADVERSE, AND LONG-TERM ENVIRONMENTAL CONSEQUENCES



CHAPTER 4

SITE-SPECIFIC MITIGATION, MONITORING, UNAVOIDABLE ADVERSE IMPACTS AND LONG-TERM ENVIRONMENTAL CONSEQUENCES

This chapter provides additional mitigation measures, a description of the applicants' baseline survey and monitoring programs, and the unavoidable adverse impacts that would occur as a result of the proposed actions. Also provided is a perspective on the effects of implementing all the applicants' proposed plans of operations on the long-term use of man's environment. Of special concern are new trends that would be established, short- and long-term benefits and trade-offs, and irreversible and irretrievable commitments of resources. In this context, "short-term" is defined as 1 to 10 years, which corresponds to the average construction period for a majority of the applicants; "long-term" is defined as longer than 10 years.

4.A SITE-SPECIFIC MITIGATION

Following the assessment of impacts, additional mitigation measures were identified that could further alleviate or minimize environmental effects. These measures, which will be required by BLM, would protect special watershed management areas, critical wildlife habitat, and unique landforms. These mitigations and the areas where they will be applied are listed below and identified in Map 4-1.

Water Resources

Sunnyside Water Supply Reserve

1. Lands that have been formally designated as a municipal water supply reserve for the Town of Sunnyside, Utah, will require approval by both the Secretary of the Interior and the Town of Sunnyside prior to occupancy or other surface activity. Exploration, mining, or other surface disturbance will require complete containment of any runoff water, mine waste, sediment, or any other potential contaminant. Discharge of any type from any disturbed site will not be allowed. This measure will reduce the impact of the projects on water resources (quality and sedimentation) and soil erosion.

Public Water Reserves/Riparian Areas

2. Occupancy or other surface activity will not be allowed. This measure will reduce the impact of the projects on water resources, soils, vegetation, wildlife, and visual resources.

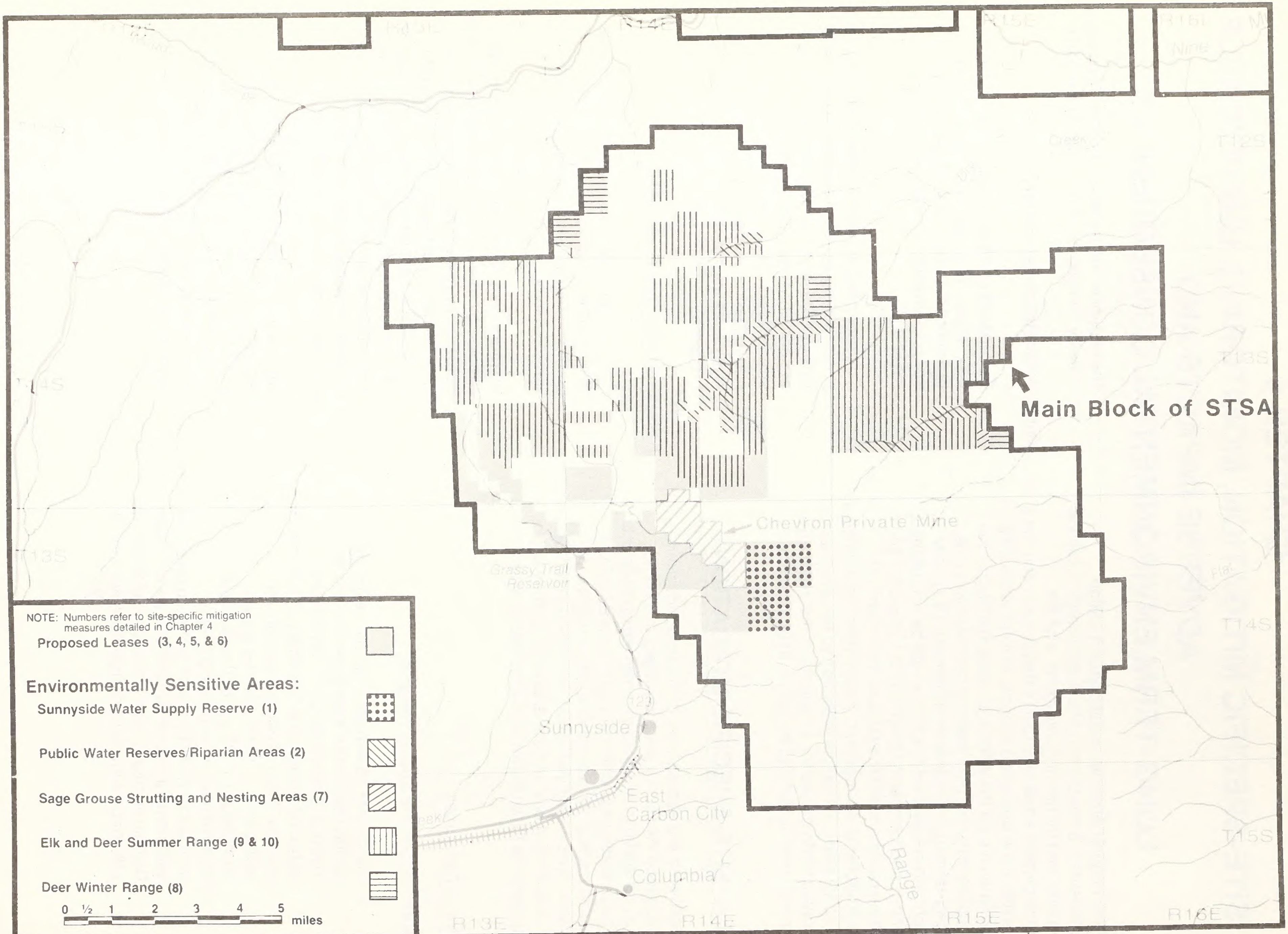
3. To protect important aquifers, all surface and in-situ mining will be preceded by complete hydrological testing and evaluation. Any loss of springs or reduction in perennial streamflow will be replaced with water of an equal quantity and quality. This measure will reduce the impact of the projects on water resources, wildlife, and livestock grazing.

Soils, Vegetation, and Reclamation

4. Occupancy or other surface disturbance will not be allowed on slopes in excess of 50 percent. This measure would not apply to surface mining.

5. No more than 25 percent of the surface area affected by this measure (see Map 4-1) will be disturbed from surface mining at any given time. Reclamation will be completed and revegetation substantially established before additional areas can be disturbed by mining. This measure will reduce the impact of the projects on water resources, livestock grazing, wildlife, soils, and vegetation.

6. Surface mining will not be allowed in aspen vegetative communities without off-site enhancement of similiar vegetative communities and of equal wildlife value. This measure will reduce the impact of the projects on vegetation and wildlife.



MAP 4-1 MITIGATION MEASURES

Wildlife Resources

7. To protect nesting sage grouse, exploration, drilling, and other development activity will not be allowed from April to mid-June. This limitation does not apply to maintenance and operation of developed mines. This measure will reduce the impact of the projects on sage grouse.

8. To protect deer winter range, exploration, drilling, and other development activity will not be allowed from November to mid-May (unless specifically permitted by UDWR). This limitation does not apply to maintenance and operation of developed mines. This measure will reduce the impact of the projects on deer.

9. To protect important elk, calving, and deer fawning areas, exploration, drilling, and other development activity will not be allowed from mid-May through mid-July. This limitation does not apply to maintenance and operation of developed mines. This measure will reduce the impact of the projects on elk and deer.

10. To protect deer summer range, exploration, drilling, or surface development activity will not be allowed from mid-May to November. This limitation does not apply to maintenance and operation of developed mines. This measure will reduce the impact of the projects on deer.

4.B **MONITORING**

4.B.1 MONITORING REQUIREMENTS

The authorizing agency has the right to require monitoring; however, that responsibility is often passed on to the state agencies. In the Sunnyside STSA, the responsibility for compliance with permits serves as the basis for the monitoring.

The Utah Department of Health, Division of Environmental Health, Bureau of Air Quality requires that meteorological data be monitored 1 year prior to construction (which is the same as the prevention of significant deterioration (PSD) permit requirement) and for 1 year during full production.

The Utah Department of Natural Resources, Division of Oil, Gas, and Mining is the monitoring agency for reclamation. At the time a mine plan is submitted, a reclamation plan and a performance bond must accompany it. The Division monitors the success of the reclamation for a period of 3 years. The Division also has the right to require monitoring of ground water if it is determined necessary.

The Utah Department of Health, Division of Environmental Health, Bureau of Water Pollution Control uses the National Pollutant Discharge Elimination System (NPDES) permit requirement of background water sampling as a baseline for water quality. In addition to this, the standards applicable to streams in the area apply. The Bureau also monitors continuously by sampling discharges at various unannounced times.

4.B.2 APPLICANTS' BASELINE AND IMPACT MONITORING PROGRAMS

The potential for lease conversions and the magnitude of mining that could result in the main block of the Sunnyside Special Tar Sand Area (STSA) would affect the resources discussed in the preceding chapters. Changes to some resources, such as visual resources, socioeconomics, and transportation networks would be very obvious. It would be more difficult to determine to what degree other resources were changing and when the change reached a stable level. Due to the subtle nature of changes to some resources, monitoring programs are often the only way to determine the magnitude of change that has taken place. Baseline monitoring programs are useful in that they establish specific and detailed baseline conditions. From this base, resource changes can be noted through subsequent impact monitoring programs. The applicants have proposed or are currently involved in monitoring or research programs for 3 resources: air quality, vegetation (reclamation), and water resources (surface water and ground water). Table 4-1 identifies each applicant's baseline and impact monitoring programs.

TABLE 4-1
APPLICANTS' BASELINE SURVEYS AND IMPACT MONITORING PROGRAMS

Applicant	Air Quality	Reclamation	Water Resources
AMOCO			
Baseline Survey	None	None	Piezometers installed in 6 drill holes - stream gauge on Range Creek.
Impact Monitoring	Dust emissions continually assessed by a particulate monitoring program.	During pilot mine operations, reclamation techniques would be evaluated for suitability in commercial development.	Above data would be used to design a monitoring system for commercial operation.
CHEVRON-GNC			
Baseline Survey	North American Weather Consultants collecting baseline data; to end in May 1983.	None	Prior to mining, water quality information would be collected.
Impact Monitoring	None	During mining, a reclamation research program would be developed.	Water quality data to be collected during mining.
ENERCOR			
Baseline Survey	None	Pre-mining baseline studies; plant species, soil amendments, and planting time.	None
Impact Monitoring	None	Vegetation success and erosion control to be monitored.	None
MONO			
Baseline Survey	None	Preliminary vegetation investigation and preliminary wildlife investigation.	Ground water quantification
Impact Monitoring	Site-specific meteorological and air quality monitoring for 1 year.	Vegetation classification and wildlife classification. Archaeological investigation. Soils classification. Chemical analysis of topography, geology, and overburden. History and current land use.	Identification and analysis of subsurface hydrologic system. Identification and analysis of surface hydrologic regime. Alluvial valley floor determination.
SABINE			
Baseline Survey	None	None	None
Impact Monitoring	Environmental monitoring would be formulated.		

The amount of available baseline data varies with each of these resources. Submittal of 1 year of baseline meteorological data is a requirement of the federal air quality permitting system. Therefore, a limited data base exists. Baseline information for reclamation is very complete. Vegetation and soil inventories exist for most of the main block of the Sunnyside STSA. The situation for water resources is different, however. A great deal of data exists on the large river systems that drain the area; however, site-specific data for the streams that drain the lease tracts is almost nonexistent. In addition to this, data on ground water on the STSA also is very limited.

4.C UNAVOIDABLE ADVERSE IMPACTS

The following unavoidable adverse impacts would result from development of the proposed actions or the unitized development alternative. No impacts are discussed for the partial conversion alternative and/or special mitigation, because the impacts presented in Chapter 3 and the comparative analysis in Chapter 2 are the final results of all committed mitigation, which includes the mitigation of partial conversion and special mitigation. Only those resource impacts that would be further reduced by the mitigation identified in this chapter are discussed here. Resource impacts identified in Chapter 3 that would not be further reduced and, therefore, are not discussed here include socioeconomics, recreation resources, visual resources, air quality, transportation networks, cultural resources, agriculture (grazing), paleontology and mineral resources, and wilderness resources.

4.C.1 PROPOSED ACTIONS

Soils and Vegetation

Mitigation measure number 4 would partially reduce the total amount of soils and vegetation that would be removed from production, because of disturbances caused by in-situ mining. An estimated 600 acres of soils and vegetation would be protected from disturbance under the constraints of this measure.

Wildlife

Mitigation measures 3, 5, 6, 7, 8, 9 and 10 would alleviate some of the adverse impacts to wildlife.

The proposed actions will destroy 24 existing springs in the STSA (39 percent), thus, reducing water availability for wildlife and, therefore, affecting distribution of less mobile species. The effect of mitigation measure number 3 would be to make water available for wildlife and to better distribute animals throughout the STSA.

Mitigation measure number 5 would partially alleviate the total amount of wildlife habitat that would be removed from productive wildlife use at any one time. Under the proposed actions, an estimated 35,945 acres of wildlife habitat would be disturbed over the life of the projects, but only about 6,500 acres would be disturbed at any one time (18 percent). If mining plans approved in the future provide for more than 6,500 acres to be disturbed at any one time, not more than 8,986 acres could be disturbed under the constraints of this mitigation measure.

The proposed actions would destroy an estimated 4,107 acres of aspen in the STSA. Mitigation measure number 5 would enhance some of this type of high quality wildlife habitat outside the mining areas and would have the effect of preventing or reducing the impact on this type of high quality habitat.The proposed actions would disturb an estimated 557 acres of sage grouse nesting habitat. Mitigation measure number 6 would protect these areas from disturbance and would have the effect of maintaining production at present levels for 1 additional year.

The proposed actions would disturb an estimated 1,500 acres of deer winter range. Mitigation measure number 7 would protect these areas from disturbance for 1 additional year prior to actual disturbance. This protection would reduce harassment of wintering mule deer and a potential loss of production due to abortion or death of adult animals.

Some deer and elk fawning and calving areas would be disturbed by the proposed actions. Mitigation measure number 8 would protect these areas from disturbance during the critical period for one

additional year. This protection would have the effect of maintaining production at current levels for 1 more year before expected reductions in numbers of young-of-the-year would occur.

Because of the limited extent of deer summer range in this area, summer ranges are critical to the survival of these animals in this part of Utah. An estimated 27,296 acres of this type of deer range would be disturbed by the proposed actions. Mitigation measure number 9 would serve to protect these ranges for one additional year prior to disturbance. This protection would enable the current population to remain stable or even to increase for one additional year.

4.C.2 UNITIZED DEVELOPMENT ALTERNATIVE

Soils and Vegetation

Total acres of soils and vegetation disturbed by in-situ mining would be partially reduced by imposition of mitigation measure number 4. An estimated 600 acres of soils and vegetation would be protected from disturbance under the constraints of this measure.

Wildlife

Impacts to wildlife and their habitats would be the same as those described for the proposed actions. However, because fewer acres would be disturbed at any one time (3,500 acres versus 6,500 acres), the degree of impact would be somewhat less.

Mitigation measures 3, 5, 6, 7, 8, 9, and 10 would reduce impacts due to the unitized development for the same time periods as discussed in the proposed actions.

4.D LONG-TERM ENVIRONMENTAL CONSEQUENCES

4.D.1 TRENDS HAVING SIGNIFICANT IMPACTS

Development of the proposed tar sand conversion leases at a commercial level would further advance the synfuels technology in the United States. Additionally, it would fully establish a trend for continuing tar sand resource use in the Sunnyside STSA. A successful and maturing tar sand industry in the Sunnyside STSA could be established by development of the proposed conversions as described in the applicants' proposed plans of operations. This could eventually result in future expansion of production by the applicants' initial projects and/or development of additional tar sand resources located within the Sunnyside STSA.

Development or expansion of tar sand reserves located in the Sunnyside STSA would increase the competition for remaining PSD increments in the area. The Clean Air Act (Public Law 95-95) ensures through National Ambient Air Quality Standards and the PSD provisions that air quality will not deteriorate beyond standards. Regulatory agencies cannot issue permits resulting in air quality violations and BLM lessees cannot conduct their activities in violation of any applicable air quality standards or related plans of implementation. A maturing tar sand industry would, therefore, tend to increase the competition for available consumable air resource increments.

Adverse impacts to wildlife populations in the STSA would last for the life of the projects. Therefore, there is a long-term adverse trend in wildlife population size due to implementation of the proposed actions.

Development of the proposed conversion areas would establish an all-weather road system throughout the main block of the STSA.

Dispersed recreation opportunities in the STSA would generally shift from semi-primitive experiences to semi-urban experiences. Hunting opportunities and the quality of hunting experiences would be diminished. Of positive trends would be

new and different sightseeing opportunities for those desiring to witness tar sand development activities.

4.D.2 BENEFITS AND TRADE-OFFS

Table 4-2 presents an overview of the benefits and trade-offs that could be associated with the proposed tar sand development. Direct quantification of the trade-offs is not possible for all resources. A review of Table 4-2 shows the items and resources that would increase in quality or quantity (generally considered to be beneficial) and those that would decrease in quality or quantity (generally considered to be exchanged to achieve the benefits).

TABLE 4-2
BENEFITS AND TRADE-OFFS

Resource/Item	Probable Increase	Probable Decrease	Variable
Oil Energy Production	X		
Tar Sand Resources[a]		X	
Tar Sand Reserves[b]			X[c]
Employment Opportunities	X		
Income Levels	X		
Local Prices and Wages	X		
Service Infrastructure	X[d]		
Public Revenues[d]	X		
Quality of Life			X[d,e]
Air Quality			
Quality as related to NAAQS		X	
PSD Increment Availability		X	
Visibility		X	
Water Quality		X	
Water Quantity		X	
Vegetative Production			X[g]
Soil Productivity			X[g]
Wildlife Populations		X	
Agriculture			X[g]
Transportation Network Use	X		
Road Quality			X[d]
Recreation Resource Use	X		
Dispersed Recreation Resource Quality[f]		X	
Wilderness Quality		X	
Cultural Resources		X	
Visual Resources		X	
Paleontological Resources		X[h]	

[a]Tar sand resources refers to the total quantity of minerals in the ground, as defined within specified limits.

[b]Tar sand reserves refers to the resources with known location, quantity and quality, which are economically recoverable through present technology.

[c]Knowledge of reserves could increase or decrease depending on information derived from mining and on-going exploration, and on the use of reserves through development.

[d]Most indicators commonly used to describe this resource/item would be likely to improve with proper planning and use of project-generated revenues, but likely would deteriorate in the absence of such measures.

[e]Quality of life is dependent on the viewers perspective and values. For example, while certain aspects of life quality could increase because of the increased income and infrastructure, other aspects would decrease because of decreased natural resource or increased population, all caused by the same development.

[f]Dispersed refers to undeveloped sites used for camping and informal day-use activities (i.e., floatboating, hiking, fishing).

[g]Productivity could generally improve with successful soil reconstruction and reclamation. Adverse conditions such as severe climatic conditions and lack of successful reclamation would cause a decrease in productivity.

[h]Resources could decrease; however, the understanding of the depositional environment could increase.

4.D.3 COMMITMENT OF RESOURCES

Implementation of the proposed actions would result in commitments to use the area more intensively and would significantly alter the use of various resources. The use and consumption of land and resources would be irreversible (once initiated, use and impacts would continue and could not be reversed for a long time, if at all) or irretrievable (irrecoverable for a long period of time or permanently). Some commitments are both irreversible and irretrievable. Should a decision be made to authorize the use of federal land for the proposed projects, some resources would be committed for the short term until certain renewable resources could be reestablished; other resources would be committed for the long term, after which resources would return to prior use or conditions.

The irreversible and irretrievable impacts to various resources from implementation of the proposed actions are illustrated in Table 4-3.

TABLE 4-3
IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Resource	Commitment Irreversible	Commitment Irretrievable	Relationship of Short-Term Use of Environment and Long-Term Productivity
Water	Yes	Yes	Mining could reduce or deteriorate the watersheds. After reclamation, they may or may not return to pre-mining productivity. During mining, springs would be lost due to removal of the strata that supplies them. After reclamation, they may or may not emerge in the same area.
Socioeconomics	Yes	No	A change to a more impersonal and segmented social structure and to increasingly urban values would probably be irreversible, but not totally irretrievable.
Vegetation	No	Yes	Vegetation would be restored to a productive condition for grazing and long-term productivity. Diversity of vegetative types would be lost in areas where changes in topography have affected localized microclimatic conditions.
Soils	No	Yes	Increased erosion would gradually return to normal rates, as revegetation and soil stabilization would take place. Long-term productivity would not be impaired.
Wildlife	No	Yes	Short-term decreases in local populations of small mammals and birds could occur. Direct mortality to small mammals would occur during surface mining. Long-term productivity could be impaired due to topography changes.
Recreation	No	Yes	Semi-primitive dispersed recreation experiences would shift irretrievably to more of a semi-urban dispersed recreation experience due to new paved roads, a change in landscape, and general development within the area. Recreationists desiring semi-primitive dispersed recreation experiences would shift irretrievably to nearby BLM, National Forest, state and private lands, and the Uintah and Ouray Indian Reservation where similar experiences could be found.
Visual	Yes	Yes	Some visual resource impacts would remain for the life of the projects or longer. Removal of physical structures and revegetation would return portions of the landscape to original conditions in the long term, but major landform modifications would remain into the long-term future.

TABLE 4-3 (Concluded)
IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Resource	Commitment Irreversible	Commitment Irretrievable	Relationship of Short-Term Use of Environment and Long-Term Productivity
Air Quality	No	No	
Transportation Networks	Yes	Yes	Traffic accidents caused by increased traffic within the study area would increase. Time lost due to reduced traffic flow on area roadways resulting from project-induced increases in traffic volume would occur.
Grazing	No	Yes	Loss of forage production due to land disturbance would be a short-term impact for 4 to 5 grazing seasons. However, mining operations would cause disruption of grazing patterns and grazing access to adjoining areas creating a long-term grazing impact in certain areas.
Cultural	Yes	Yes	Implementation of the proposed projects would involve an irretrievable commitment of archaeological values to exploration and investigation under current technical procedures. Once destroyed, these values would not be available for future study. Salvage sites could not be studied with more advanced technological methods that might be developed in the future. Increased population levels would exert additional pressure on these resources, resuiting in overuse and destruction. The total number of sites that could be affected is unknown.
Paleontology	Yes	Yes	Destruction of paleontological resources would be an irreversible permanent commitment of the resources.

Note: For specifics on the units of these resources that would be affected by the proposed actions and alternatives, see Chapter 2 or the appropriate resources sections in Chapter 3.

REFERENCES

The following symbols are used to help the reader locate copies of the references. The appropriate symbol will appear at the end of each citation.

E - Available for inspection at Bureau of Land Management, Division of Environmental Impact Statement Services, 555 Zang Street, First Floor East, Denver, Colorado 80228. Copies of some items are available at cost for reproduction.

L - Available through public library loan system.

M - Available at Bureau of Land Management, Moab District Office, P.O. Box 970, 125 West 200 South, Moab, Utah 84532.

P - Available at Bureau of Land Management, Price River Resource Area Office, P.O. Box AB, 900 North 7th East, Price, Utah 84501.

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GLOSSARY

AIR QUALITY CRITERIA—The varying amounts of pollution and lengths of exposure at which specified adverse effects to health and welfare take place.

AIR QUALITY MODEL—A mathematical representation of the behavior of air pollutants or their effects on air quality related values.

AIR QUALITY RELATED VALUE (AQRV)—A feature or property of an area (e.g., visibility) that is affected in some way by air pollution.

ALLUVIAL FAN—Unconsolidated sedimentary material deposited by streams in fan- or cone-shaped deposits at the base of mountains.

AMBIENT AIR QUALITY—Concentration levels in ambient air for a specified pollutant and a specified averaging time period within a given area.

AMBIENT AIR QUALITY STANDARD—A level of ambient air quality established by federal or state agencies which is to be achieved and maintained; primary standards are those judged necessary, with an adequate margin of safety, to protect the public health; secondard standards are those judged necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Ambient standards are given in micrograms per cubic meter.

ANCILLARY FACILITIES—Structures (compressor stations, power and communication lines, cathodic protection systems) which are necessary for the continuous operation or maintenance of the project.

ANIMAL UNIT MONTH—The amount of forage required to sustain the equivalent of 1 cow or 6.2 sheep for 1 month; 5.8 deer for 1 month; 9.6 antelope for 1 month; 5.5 bighorn sheep for 1 month; or 2.2 burros for one month (usually 800 lbs. of usable air-dried forage).

ASPECT (Soils and Vegetation)—The direction that a slope faces.

BASELINE—Projected conditions expected to exist in the area of influence, excluding the applicants' projects and the interrelated projects.

BITUMEN—A naturally occurring viscous mixture of hydrocarbons, such as asphalt, that may contain sulphur compounds and that, in its naturally occurring state, is not recoverable at a commercial rate through a well, but when processed produces a synthetic oil.

CADASTRAL—Showing or recording property boundaries, subdivision lines, buildings, and other related details.

CARBON MONOXIDE (CO)—A colorless, odorless, toxic gas produced by the incomplete combustion of carbon-containing substances. One of the major air pollutants, it is emitted in large quantities by exhaust of gasoline-powered vehicles.

CENSUS COUNTY DIVISION (CCD)—A part of a county, defined by the Bureau of the Census. Maps showing CCD boundaries are included in the Population Census report for each state.

CLASS I, II, AND III AREAS (Air Quality)—Regions in attainment areas where maintenance of existing good air quality is of high priority. In Class I areas, maintaining air quality is regarded as having the highest priority with respect to other values; in Class III areas, air quality has lower priority than it does in the other areas. Initially, all attainment areas except mandatory Class I areas were designated Class II.

COFFERDAM—A watertight enclosure from which water is pumped to expose the bottom of a body of water and permit construction.

COKER NAPHTHA—Naphtha recovered from the coking process.

COLLECTIVE IMPACTS—For purposes of this EIS, collective impacts are those impacts that would occur as a result of the proposed actions and alternatives.

COLLUVIAL—Rock detritus and soil accumulated at the foot of a slope.

COMBINED HYDROCARBON LEASE—A lease issued in a Special Tar Sand Area (STSA) which entitles the lessee to remove any gas and nongaseous hydrocarbon substance other than coal, oil shale, or gilsonite.

CRETACEOUS—Of, relating to, or being the last period of the mesozoic era or the corresponding system of rocks.

CULTURAL RESOURCES—Remains of human activity, occupation, or endeavors, as reflected in sites, buildings, artifacts, ruins, etc.

CUMULATIVE IMPACTS—For purposes of this EIS, cumulative impacts are those impacts that would occur as a result of the proposed actions and alternatives plus other interrelated projects planned for development in the Sunnyside Special Tar Sand Area during the analysis period.

DECANT—To draw off without disturbing the sediment or the lower liquid layers.

DECOMMISSION—Abandonment.

DENDRITE—A branching treelike figure produced on or in a mineral by a foreign mineral.

DRAINAGE FLOW (Air Quality)—Typical of mountain regions and caused by the gravitation of cold air off high ground.

DRAINAGE WIND—A wind directed down the slope of an incline and caused by greater air density near the slope than at the same level some distance horizontally from the slope.

EMISSION—Effluent discharge into the atmoshpere, usually specified in terms of mass per unit time.

EMISSION INVENTORY—A list of air pollutants emitted into a community's atmosphere, in amounts (commonly tons) per day, by type of source.

EMISSION INVENTORY—Data set containing emission source information usually for use in the application of an air quality simulation model.

ENDANGERED SPECIES—Any animal or plant species in danger of extinction throughout all or a significant portion of its range.

FACIES—A particular local aspect or modification of an ecological community; general appearance.

FLUVIAL—Of, or relating to, or living in a stream or river.

FORB—A broad-leafed herb.

FRIABLE—Easily crumbled or pulverized.

FUGITIVE DUST—Solid airborne particles emitted from any source other than a stack.

HYDROCARBONS—Organic chemical compounds of hydrogen and carbon atoms which form the basis of all petroleum products.

INCREMENTS (Air Quality)—Maximum allowable increases over baseline concentrations of pollutants covered by the PSD provisions in Class I, II, and III areas.

INFRASTRUCTURE—The set of supporting systems and facilities (i.e., transportation, education, medical service, communication, fire, and police protection, etc.) that support a region's or community's social and economic structures.

IN-SITU EXTRACTION—Extracting the bitumen from tar sand while it is still in the ground by injecting steam, solvents, and/or heat.

ISOPLETH—A line or contour drawn on a map denoting points having equal value of a quantity; e.g., similar temperature (isotherm), pressure (isobar), or pollutant concentrations.

LEACHATES—A solution or product obtained by percolating liquid in order to separate the soluble components.

LINEAR SOURCE—A line or trajector at which material or other matter is added to a system either instantaneously or continuously.

MANDATORY CLASS I AREA (Air Quality)—An international park, a national wilderness area or national memorial park larger than 5,000 acres, or a national park larger than 6,000 acres. States may not reclassify mandatory Class I areas.

METALLIFEROUS—Yielding or containing metals.

OXIDANT—Substance in the air (e.g., nitrogen dioxide, ozone) which makes available oxygen or oxygenated compounds for chemical reaction. Oxidants are formed, for example, from the reaction

of certain reactive hydrocarbons and nitrogen dioxide, under the influence of sunlight.

OZONE—A pungent, colorless, toxic gas. As a product of the photochemical process, it is a major air pollutant.

PALEONTOLOGY—A science dealing with the life of past geological periods as known from fossil remains.

PARTIAL CONVERSION ALTERNATIVE AND/OR SPECIAL MITIGATION—An alternative to convert only part of the leases to combined hydrocarbon leases.

PARTICULATE—A particle of solid or liquid matter: soot, dust, aerosols, fumes, and mist.

PARTS PER MILLION (PPM)—The number of parts of a given pollutant in a million parts of air; a measure of concentration.

PARTURITION—The action or process of giving birth to offspring.

PEDIMENT—A broad gently sloping bedrock surface with low relief that is situated at the base of a steeper slope and is usually thinly covered with alluvial gravel and sand.

PHOTOCHEMICAL PROCESS—The chemical changes brought about by the radiant energy of the sun acting upon various polluting substances. The products are known as photochemical smog.

PHOTOCHEMICAL SMOG—The smog prevalent in the daytime around sunny, poorly ventilated, heavily motorized urban areas and characterized by the interaction of nitrogen oxides and certain hydrocarbon compounds under the influence of sunlight and, normally in relatively stagnant air. It may reduce vegetation. Automotive exhaust is a prime source of the gases that can produce this form of pollution.

PHYSICAL STACK HEIGHT—Actual height of a stack, i.e., a pollutant source.

PHYSIOGRAPHIC PROVINCE—A region that has similar topographic form.

PIEZOMETER—Instrument for monitoring water levels.

PLUME (Air Quality)—The volume of air space containing any of the substances emitted from a source. A characteristically-shaped stream of materials or heated gases entering the atmosphere from a localized source such as a stack. A plume may be visible (smoke, water droplets, etc.) or invisible (heated air).

POLLUTANT—With respect to the atmosphere, any substance discharged into the ambient air tending to create a harmful effect upon man, his property, convenience or happiness, or that causes the contamination in ambient air to exceed legally established limits.

PREVAILING WINDS(S)—The wind direction(s) most frequently observed during a given period.

PREVENTION OF SIGNIFICANT DETERIORATION (PSD)—A regulatory program based not on the absolute levels of pollution allowable in the atmosphere but rather on the amount by which present air quality will be allowed to deteriorate in a given area.

PRIME AGRICULTURAL LAND (also Prime Farmland)—Land that is best suited for producing food, feed, forage, fiber, and oilseed crops. The inventory of prime agricultural land is maintained by the U.S. Department of Agriculture, Soil Conservation Service.

PROJECT LIFE—The time from the first disturbance to the recovery of understory vegetation, which includes construction, operation, abandonment, reseeding, plus 4 years for understory revegetation.

RECLAMATION—The process of converting mined land to its former or other productive uses.

RETORTING—To treat oil shale by heating in a vessel in which substances are distilled or decomposed by heat.

RILL—Channel made by a small stream.

RIPRAPPED—Strengthed or supported with a foundation or sustaining wall of stones thrown together without order.

SCREENING LEVEL—A simplistic approach designed to determine the need for additional, more detailed analyses.

SLASH—The debris from an open tract in a forest strewn with debris (as from logging).

SPENT SAND—Sand exhausted of active or required components or qualities for a particular purpose.

SPECIAL TAR SAND AREA (STSA)—An area containing substantial deposits of tar sand as identified by the Department of the Interior in the **Federal Register**—November 20, 1980 (45 FR 76800) and January 21, 1981 (46 FR 6077). All STSAs are located in Utah.

SPOIL—Earth and rocks excavated or dredged.

STEADY-STATE OPERATIONS—Operating the plant at design capacity, and operating a mine at its full production size, at which time the maximum number of acres would be disturbed at any one time and for each new acre disturbed, an acre would be revegetated.

SULFUR OXIDES—Pungent, colorless gases formed primarily by the combustion of fossil fuels; considered major air pollutants, sulfur oxides may damage the respiratory tract as well as vegetation.

TAILINGS—Residue separated in the preparation of various products (as ores).

TAR SAND—A sand which is impregnated with petroleum.

THERMAL EXTRACTION—A method of extracting bitumen by use of heat.

THREATENED SPECIES—Any plant or animal species likely to become endangered within the foreseeable future throughout all or a part of its range.

TOTAL SUSPENDED PARTICULATE MASS (TSP)—A criteria pollutant measured as the mass of all particles in the atmosphere, without regard to size or chemical composition.

UPWIND—The direction from which the wind is blowing.

VALLEY WINDS—A wind which ascends a mountain valley during the day.

VISUAL RESOURCE MANAGEMENT—The planning, design, and implementation of management objectives to provide acceptable levels of visual impacts for all resource management activities.

VISUAL RESOURCE MANAGEMENT (VRM) CLASS—The degree of visual change that is acceptable within the existing characteristic landscape. It is based upon the physical and sociological characteristics of any given homogeneous area and serves as a management objective.

WILDERNESS AREA—An area officially designated as wilderness by Congress. Wilderness areas will be managed to preserve wilderness characteristics and shall be devoted to the public purposes of conservation and recreational, scenic, scientific, educational, and historical uses.

WORK FORCE—The total number of workers on a specific project or group of projects. Other terms for it are direct employment and primary employment.

ABBREVIATIONS

AADT—average annual daily traffic

AAMT—average annual monthly traffic

Ac-ft/yr—acre-feet per year

ANFO—ammonium nitrate and fuel oil

AUM—animal unit month

BACT—best available control technology

BLM—Bureau of Land Management, U.S. Department of the Interior

bpd—barrels per day

bpsd—barrels per stream day

Btu—British thermal unit (a measure of heat)

CCD—Census County Division

cm/s—centimeters per second

CO—carbon monoxide

COAR—Contracting Officer's Authorized Representative

COE—Corps of Engineers, U.S. Department of the Army

CVSSD—Castle Valley Special Service District

D&RGW—Denver and Rio Grande Western Railroad

EIS—environmental impact statement

EPA—Environmental Protection Agency

FLPMA—Federal Land Policy and Management Act

FS—Forest Service, U.S. Department of Agriculture

FWS—Fish and Wildlife Service, U.S. Department of the Interior

g/m^2-yr—grams per square meter per year

MADT—monthly average daily traffic

mg/l—milligram per liter

mg/m^3—milligrams per cubic meter

mbpd—million barrels per day

MS—mesa escarpments

MVMT—million vehicle miles traveled

NAAQS—National Ambient Air Quality Standards

NEPA—National Environmental Policy Act

NO_x—nitrogen oxide

NO_2—nitrogen dioxide

NPDES—National Pollutant Discharge Elimination System

NPS—National Park Service, U.S. Department of the Interior

O^3—ozone

ORV—off-road vehicle

PAN—peroxy acyl nitrate

PCPI—per capita personal income

ppm—parts per million

PSD—prevention of significant deterioration

SCS—Soil Conservation Service, U.S. Department of Agriculture

SO_2—sulfur dioxide

SO_4—sulfates

SR—state road

STSA—special tar sand area

TDS—total dissolved solids

TSP—total suspended particulates

UDEH—Utah Division of Environmental Health

ABBREVIATIONS

UDOGM—Utah Division of Oil, Gas, and Mining

UDSLF—Utah Division of State Lands and Forestry

UDOT—Utah Department of Transportation

UDWR—Utah Division of Wildlife Resources

$\mu g/m^3$—micrograms per cubic meter

UPED—Utah Process Economic and Demographic model

URA—unit resource area

USGS—Geological Survey, U.S. Department of the Interior

USLE—universal soil loss equation

VMT—vehicles miles of travel

VRM—Visual Resource Management

VTPD—vehicle trips per day

WSA—wilderness study area

SUNNYSIDE COMBINED HYDROCARBON LEASE CONVERSION EIS
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APPENDIX A-1
CONSULTATION AND COORDINATION

PUBLIC INVOLVEMENT IN THE SCOPING PROCESS

The first step in preparing an environmental impact statement (EIS) is called "scoping." The scope of an EIS is the range of actions, alternatives, and impacts to be included in the document. The purpose of scoping is to determine the significant issues related to a proposed action that would be included in the EIS. Scoping is designed to reduce some of the past inefficiencies associated with EIS preparation. Its basic goal is to make EISs concise and meaningful to persons in the federal government who must make decisions on the proposal, as well as those in state and local government, and the people who may be affected by approval or disapproval of the proposal or its alternatives.

The scoping process used by the Bureau of Land Management (BLM) for the Sunnyside Combined Hydrocarbon Lease Conversion EIS involved several phases: planning for public involvement, sponsoring a public meeting, analyzing identifed concerns, and determining the scope of the EIS. The key development related to each of these phases are summarized below.

PLANNING FOR PUBLIC INVOLVEMENT

Following determination by the Utah State Director that an EIS was necessary for the Sunnyside lease conversion applications, the Moab District Office (in conjunction with the Denver Service Center, Division of EIS Services) began to plan for public involvement in the scoping process. A scoping meeting was arranged for Price, Utah.

The scoping meeting and the availability of background information on the proposed actions were publicized through a **Federal Register** notice and media announcements in Price and Salt Lake City.

SCOPING MEETING

The scoping meeting, held on March 9, 1983, was organized as an open house meeting. It was conducted jointly with the open house scoping meeting for the Utah Combined Hydrocarbon Regional EIS. Attendees were provided copies of background information about the EIS process and the proposed actions. Members of the Sunnyside and Regional EIS teams, and Price River Resource Area, Moab District, and Washington Office BLM personnel were on hand to listen to attendees' concerns about the proposed actions and to answer questions.

Following the close of the meeting, BLM personnel shared what they learned from the attendees. The concerns and questions raised by the attendees are listed below. All were considered in developing the scope of the Sunnyside EIS.

- Companies should unitize; they should design one good project that will become operational and provide for protection of the environment. The area needs the jobs that could be provided by tar sand development, but there is a right way and a wrong way to go about development.
- The water source that one company is proposing to use is the one that another company says it will preserve for the town of Sunnyside. How much water will be used and how much will be left for Sunnyside?
- If companies are permitted to dump overburden in Whitmore Canyon, the existing problem with siltation of the Grassy Trail Reservoir will increase.

- The proposed mines will break up the bitterbrush planting that is just getting established.

- Will the companies provide for public access to Bruin Point?

- What type of reclamation will be considered acceptable? How much land will be disturbed at one time? The companies should not be allowed to tear up the whole area before reclamation is started.

- Carbon County believes it is very important for the EIS preparers to work closely with local governmental agencies and use data developed by local people.

- Impacts to visual resources should not be considered a significant issue, because the Sunnyside area is not considered to be a Class I area.

- Cumulative impacts for the Sunnyside Special Tar Sand Area (STSA) should not be based on a total of the impacts of the 5 applicants' plans of operations, because some applicants have assumed use of the same resource base.

- The Sunnyside STSA should be expanded to include the proven tar sand reserves outside the STSA boundary.

Subsequent to the scoping meeting, BLM personnel attended a Carbon County Commissioners' meeting to discuss, in greater detail, local concerns related to the proposed actions and the EIS process. The concerns that were discussed are summarized in a letter from Carbon County, reprinted as Figure A-1-1.

The Ute Indian Tribe submitted its comments on the scope of the EIS in writing. These comments are reprinted as Figure A-1-2.

DETERMINING THE EIS SCOPE

The scope of the Sunnyside Combined Hydrocarbon Lease Conversion EIS was derived based on the issues and concerns identified through the public scoping process, preliminary research done by the EIS preparers (resource specialists from the BLM), information needs of the decision maker, and the relationship between the Sunnyside EIS and the Utah Combined Hydrocarbon Regional EIS. The scope evolved through lengthy discussions among Sunnyside EIS team members and through discussions among these team members and members of the Regional and Tar Sand Triangle EIS teams.

DRAFT EIS CONSULTATION AND COORDINATION

The agencies and groups that will receive a copy of the Draft EIS for formal review are listed below.

Federal Government Agencies

Department of the Interior
- Bureau of Indian Affairs
- Bureau of Reclamation
- Fish and Wildlife Service
- Geological Survey
- National Park Service
- Office of Environmental Project Review
- Office of Surface Mining

Department of Agriculture
- Forest Service
- Soil Conservation Service

Advisory Council on Historic Preservation

Department of the Army
- Corps of Engineers

Department of Energy
Department of Housing and Urban Development
Department of Transportation
Environmental Protection Agency
Federal Energy Regulatory Commission
Federal Highway Administration
Postal Service
Synthetic Fuels Corporation

Environmental Groups

American Wilderness Alliance
Council on Utah Resources
Defenders of the Outdoor Heritage
Earth First
Friends of the Earth
Izaak Walton League
National Audubon Society
National Wildlife Federation
Native Study Society
Sierra Club

ISSUES OF CONCERN TO CARBON COUNTY

WITH REFERENCE TO THE SUNNYSIDE COMBINED

HYDROCARBON LEASE CONVERSION E.I.S.

1. Water Quality and Watershed Protection for both Whitmore and Range Creek Drainages.

The issue of which of these drainages will serve for industrial and which one for culinary is the most important concern for Carbon County as well as East Carbon and Sunnyside. This issue is very complex because of the ownership conflicts. Chevron/GNC has indicated a desire to use the Whitmore/Grassy Trail drainage for their rather substantial industrial needs. They are saying that East Carbon could then use the Range Creek drainage for its water needs. However, Amoco and Mono Power have large tar sands holdings at the head of Range Creek. These properties are going to have an impact on Range Creek just from the mining itself irregardless of where industrial water is drawn. It is critical that all of the major developers get together and talk over mutual management policies. We feel that the B.L.M., the state and the county cannot say yes to Chevron until we know what Amoco and Mono Power are going to do for their water needs.

With the magnitude of the various projects in mind it is an apparently obvious conclusion that there will be a general degradation of water quality in both streams which potentially would serve East Carbon. The water quality data submitted should be reviewed very carefully. There has already been water quality problems on the Range Creek drainage due to the high level of exploratory drilling going on in the area.

2. Establishment of Project Carrying Capacity.

Going along with number 1 above the E.I.S. should evaluate the effect of five individual projects as well as a smaller number beginning with just one project. It is Carbon Counties opinion that the area cannot support five separate projects. Probably one project should be the maximum allowed because of several reasons. First of all are the socio-economic considerations. Several projects would bring in many more transient construction workforce personnel which are expensive and difficult to manage and the impact would extend over a long period of time. One project would provide a manageable workforce over a fixed period of time. With several projects there would be duplication of services, need for more temporary structures (i.e. man-camps), many more people etc. which will put a burden on local governments which it may not be able to handle even with assistance from the developers.

We feel the area has a carrying capacity environmentally as well. There would obviously be impacts multiplied by the number of projects. There would be more discharge permits, more overburden stockpiles, more roads, more particulate emissions, more truck traffic and the list would go on and on. We hope the E.I.S. will not only state the impacts for the various development levels but go as far as to recommend what the carrying capacity should be. The E.I.S. could then be the catalyst to get all the

FIGURE A-1-1

players together at a very early stage and discuss the alternatives. An agreement between these major companies on production levels, number and size of projects, etc., will be difficult to arrive at, but for the welfare of the small towns in the area it must be done.

3. The Socio-economic Impact Statement.

Carbon County wishes to be involved in the preparation of this section of the document from the beginning. The statement has been underway since January and we have never been contacted as yet. We have seen in the past that most of the statements are not really useful documents for local governments and the companies have to duplicate the research to satisfy local and state requirements. Very simply the document should contain information on the effect of the project on at least the following:

Population
Housing-temporary and permanent
Water supply and watershed protection
Waste water disposal
Employment
Transportation (roads, etc.)
Public safety-police, fire, medical, etc.
School systems

These infrastructure elements need to be addressed for Carbon County generally, not just the East Carbon/Sunnyside area. Also it will be imperative that the E.I.S. address mitigation of the identified impacts. Things like front-end assistance, on-going assistance, operation and maintenance costs and subsidized housing if decided upon and others should be discussed. Close contact with the companies will be required to get this level of information. If this is not within the scope of the statement it should be. It will have to be done at some point.

We hope the statement will not make the mistake, as have several impact analyses lately, that the company will have little impact due to unemployment. By the time the Tar Sands projects get going there may not be any unemployment. The tar sands developments are dependent somewhat on oil prices as is the coal industry. A possible way to approach this problem is to provide several alternative development "scenarios". Each of these alternatives would assume different combinations of unemployment and immigration as well as different distribution models of the workforce. They can't all live in East Carbon/Sunnyside.

Carbon County would like to get together with B.L.M. and consultants and identify the further issues which need to be discussed.

4. Refuse Disposal.

The city of East Carbon is very concerned about anticipated plans of Chevron Oil to dispose of overburden in Spatafore Canyon which drains directly, over a short distance, into Grassy Trail Reservoir their culinary water source. This dilemma leads back to a decision on water sources for the town. We must decide which source of water the town will be use be it Whitmore or Range Creek. We will have to protect one or the other.

FIGURE A-1-1(cont)

UTE INDIAN TRIBE
FORT DUCHESNE, UTAH

Ute Indian Tribe
P.O. Box 190
Fort Duchesne, Utah 84026

(801) 722-5141

In Reply:

RECEIVED
APR 18 1983
EIS OFFICE

April 13, 1983

Robert E. Piegel
EIS Services
Bureau of Land Management
555 Zang Street
First Floor East
Denver, Colo. 80228

Dear Bob:

Enclosed are the scoping comments of the Ute Tribe concerning the Sunnyside Combined Hydrocarbon Lease Conversion EIS. We look forward to a continued working relationship with your office and the BLM.

Respectfully,

Jason Cuch

Jason Cuch
Director of Resources

FIGURE A-1-2

The Ute Indian Tribe is concerned about:

AIR QUALITY

The proximate location of the Sunnyside property will affect air quality in the Uintah Basin and the Uintah and Ouray Reservation. Emissions from both construction and processing operations would enter the air shed of the Uintah Basin, reaching the Uintah and Ouray Reservation air shed first. This will impact the visibility (visual resource) and place limits on the available PSD air increments. In turn, air quality related values will be impacted as pollution levels increase and effect flora and fauna, and rains will increase soil sulfur levels and total suspended particles.

The Ute Indian Tribe requests that air quality studies include an examination of the impacts generated on the Uintah and Ouray Reservation and the Uintah Basin air shed, especially as relating to PSD liscensing.

RECREATION

Recreational facilities will also be impacted in the Uintah Basin by the Sunnyside work force and will require specific studies.

FIGURE A-1-2 (cont)

Trout Unlimited - Utah Chapter
Utah Native Study Society
Utah Wilderness Association
Women's Conservation Council of Utah

State Governments and Agencies

Utah
- Department of Community and Economic Development (and various divisions)
- Department of Health (and various divisions)
- Department of Natural Resources and Energy (and various divisions)
- Department of Social Services
- Department of Transportation
- Geological and Mineral Survey
- Governor's Office
- Library Commission
- Planning Coordinator's Office (State Clearinghouse)
- State Agriculture Stabilization Conservation Service Office

Local Governments

Utah
- Carbon County Commission
- Duchesne County
- East Carbon City Government
- Emery County Commission
- Grand County Commission
- Price City Government
- Sunnyside City Government
- Uintah County Commission

Ute Indian Tribe

APPENDIX A-2
SUMMARY OF APPLICANTS' PLANS OF OPERATIONS AND IMPACTS

The following tables are a compilation and summary of the applicants' proposed actions. Together the sum of these 5 sets of tables would equate to the collective totals previously discussed. The first two tables for each applicant present the data as discussed by them in their plans of operations. The final table summarizes the quantities of resources to be utilized and the potential effects on the Sunnyside Special Tar Sands Area (STSA) and surrounding area.

TABLE A-2-1
AMOCO: GENERAL DATA

Proposed Conversion	
Number of Leases	7
Area	9,602.08 acres
Exploration	
Duration of Exploration	1 year
Drill Rigs in Use at One Time	3
Trucks to be Used	8
Trips Per Truck Per Day	4
Maximum Workers at One Time	10
Total Area Disturbed and Reclaimed	13 acres
Test Mine (including ancillary facilities)	
Total Area Disturbed	116
Pilot Plant	
Synfuel Production Level	150 barrels/day
Location	Wellington, Utah
Total Area Disturbed	15 acres
Commercial Operation	
Commercial Operation Life	3[a] years
Tar Sand Mined Over 30[a] Years	3,150 million tons
Tar Sand Mined Per Year	105 million tons/year
Synfuel Production Level	50,000 barrels/day
Water Source	Price River
Water Use	12,000 acre-feet/year
Peak Construction Work Force	475 workers
Peak Operation Work Force	2,465 workers
Total Area Disturbed[b]	12,082 acres

[a]Amoco has stated commercial operation life would be 20 years plus. For analysis purposes, a life of 30 years was assumed.
[b]For an explanation of these acreages, see analysis assumptions in Section 1.C.2.

TABLE A-2-2
AMOCO: MAGNITUDE AND DURATION OF LAND DISTURBANCE
(acres)

Phase/Component	Total Surface Mine Disturbance: Disturbed	Removed	Reclaimed	Acreage Disturbed at One Time — Duration: 1 year	20+ years
Exploration	13[a]	0	13	1[a]	0
Commercial Operation					
Mine	3,000	0	3,000	0	3,000
Plant	110	110	0	0	110
Spent Sand Disposal	1,500	0	1,500	0	750
Ancillary Facilities	870	0	870	870	0
Total	5,480[b]	110	5,370	870	3,860[b]

[a]During the exploration phase, a total of 13 acres would be disturbed; however, since each drill site would be reclaimed upon the completion of drilling, no more than 1 acre would be disturbed at one time.

[b]Over the life of the project (before abandonment), a total of 5,480 acres would be disturbed; however, as mining progresses, no more than 3,860 acres would be disturbed at one time. "Acreage disturbed at one time" is defined as the total acreage in the first four stages of reclamation as shown on Figure 1-9 (Chapter 1).

TABLE A-2-3
AMOCO IMPACT SUMMARY

Resource Element	Disturbance
Number of Leases - 7	
Lease Acreage - 9,602.8 ac	
Mine Life - 30 yr	
Total Disturbance - 12,092 ac	
Water Resources	
Source	Price River
Acreage	12,000 ac-ft/yr
Special Watershed Management Area Disturbance	1,000 ac
Socioeconomics	
Peak Construction Employment	475
Peak Operation Employment	2,465
Vegetation and Soils	
Land Disturbance at One Time[a]	3,150 ac
Land Disturbance in Climatic Zone B	267 ac
Very Steep Terrain Area Disturbance[b]	7,989 ac
Wildlife	
Potential Population Reduction, Mule Deer Herd Unit 27B	5%
Area on Which Other Big Game Species Would Be Displaced	12,082 ac
Area on Which Resident Populations of Other Species Would be Lost	12,082 ac
Visual Resources[c]	
Area Significantly Affected, Class II	6,662 ac
Class III	775 ac
Class IV	3,750 ac
Undetermined	870 ac
Air Quality	
National Ambient Air Quality Standards	
Sulfur Dioxide[d] (3-hr)	474 $\mu g/m^3$
(24-hr)	130 $\mu g/m^3$
Annual	14 $\mu g/m^3$
Total Suspended Particulates[d] (24-hr)	685 $\mu g/m^3$
Annual	172 $\mu g/m^3$
Nitrogen Oxides[d] Annual	100 $\mu g/m^3$
Uintah and Ouray Indian Reservation	
Sulfur Dioxide (24-hr)	2 $\mu g/m^3$
Total Suspended Particulates (24-hr)	0 $\mu g/m^3$
Transportation Networks	
Level-of-Service lowered below C on US 6, SR 10, and SR 123.	
Increased volume and accidents.	
Agriculture	
Grazing Loss Per Year	180 AUM
Number of Allotments Affected	4
Cultural Resources	
Number of cultural resources affected cannot be known until area has been surveyed.	
Paleontology and Mineral Resources	
Paleontological Resources	Minor Loss
Resource Mined	105 million ton/yr
Oil Production	50,000 bpd

[a]Refer to Figure 2-1 in Chapter 2 showing land disturbance by year of operation.
[b]Lands with slopes exceeding 30 percent and dominated by 40 to 70 percent, including escarpments and canyon sides.
[c]Refer to Appendix A-9, Visual Resource Management Methodology, for definitions of VRM classes.
[d]National Ambient Air Quality Standard shown in parentheses.

ac = acre
ac-ft/yr = acre feet per year
AUM = animal unit month
bpd = barrels per day
ft/yr = feet per year
hr = hour
ton/yr = tons per year
$\mu g/m^3$ = micrograms per cubic meter
yr = year

TABLE A-2-4
CHEVRON-GNC: GENERAL DATA

Proposed Conversion	
Number of Leases	1
Area	160.00 acres
Exploration	
Duration of Exploration	1 year
Drill Rigs in Use at One Time	1
Trucks to be Used	2
Trips Per Truck Per Day	4
Maximum Workers at One Time	3
Total Area Disturbed and Reclaimed	4 acres
Test Mine (including ancillary facilities)	
Total Area Disturbed	5 acres
Pilot Plant	
Synfuel Production Level	NA[a]
Location	NA[a]
Total Area Disturbed	NA[a]
Commercial Operation	
Commercial Operation Life	30 years
Tar Sand Mined Over 30 Years	222 million tons
Tar Sand Mined Per Year	7.4 million tons/year
Synfuel Production Level	10,000 barrels/day
Water Source	Price River
Water Use	4,500 acre-feet/year
Peak Construction Work Force	2,400 workers
Peak Operation Work Force	200 workers
Total Area Disturbed[b]	325 acres

[a]Not Applicable. Processing plant would be an expansion of the plant associated with the Chevron interrelated project described in Section 1.A.4.
[b]For an explanation of these acreages, see analysis assumptions in Section 1.C.2.

TABLE A-2-5
CHEVRON-GNC: MAGNITUDE AND DURATION OF LAND DISTURBANCE
(acres)

	Total Surface Mine Disturbance			Acreage Disturbed at One Time	
				Duration	
Phase/Component	**Disturbed**	**Removed**	**Reclaimed**	**1 year**	**30 years**
Exploration	4	0	4	4	0
Commercial Operation					
Mine	155	0	155	0	80
Plant	NA[a]	NA[a]	NA[a]	NA[a]	NA[a]
Spent Sand Disposal	NA[a]	NA[a]	NA[a]	NA[a]	NA[a]
Ancillary Facilities	170	170	0	170	0
Total	325[b]	170	155	170	80[b]

[a]Not Applicable. Processing plant would be an expansion of the 200-acre plant site associated with the Chevron interrelated project described in Section 1.A.5, Interrelationships.

[b]Over the life of the project (before abandonment), a total of 325 acres would be disturbed; however, as mining progresses, no more than 80 acres would be disturbed at one time. "Acreage disturbed at one time" is defined as the total acreage in the first four stages of reclamation as shown on Figure 1-9 (Chapter 1).

TABLE A-2-6
CHEVRON-GNC IMPACT SUMMARY

Resource Element	Disturbance
Number of Leases - 1	
Lease Acreage - 160 ac	
Mine Life - 30 yr	
Total Disturbance - 325 ac	
Water Resources	
Source	NA
Acreage	NA
Special Watershed Management Area Disturbance	0 ac
Socioeconomics	
Peak Construction Employment	2,000
Peak Operation Employment	380
Vegetation and Soils	
Land Disturbance at One Time[a]	80 ac
Land Disturbance in Climatic Zone B	0 ac
Very Steep Terrain Area Disturbance[b]	160 ac
Wildlife	
Potential Population Reduction, Mule Deer Herd Unit 27B	<1%
Area on Which Other Big Game Species Would Be Displaced	325 ac
Area on Which Resident Populations of Other Species Would be Lost	325 ac
Visual Resources[c]	
Area Significantly Affected, Class II	155 ac
Class III	0 ac
Class IV	0 ac
Undetermined	170 ac
Air Quality	
National Ambient Air Quality Standards	
Sulfur Dioxide[d] (3-hr)	0 $\mu g/m^3$
(24-hr)	0 $\mu g/m^3$
Annual	0 $\mu g/m^3$
Total Suspended Particulates[d] (24-hr)	180 $\mu g/m^3$
Annual	40 $\mu g/m^3$
Nitrogen Oxides[d] Annual	0 $\mu g/m^3$
Uintah and Ouray Indian Reservation	
Sulfur Dioxide (24-hr)	0 $\mu g/m^3$
Total Suspended Particulates (24-hr)	0 $\mu g/m^3$
Transportation Networks	
Level-of-Service lowered below C on US 6, SR 10, and SR 123.	
Increased volume and accidents.	
Agriculture	
Grazing Loss Per Year	6 AUM
Number of Allotments Affected	1
Cultural Resources	
Number of cultural resources affected cannot be known until area has been surveyed.	
Paleontology and Mineral Resources	
Paleontological Resources	Minor Loss
Resource Mined	14.4 million ton/yr
Oil Production	NA

[a]Refer to Figure 2-1 in Chapter 2 showing land disturbance by year of operation.

[b]Lands with slopes exceeding 30 percent and dominated by 40 to 70 percent, including escarpments and canyon sides.

[c]Refer to Appendix A-9, Visual Resource Management Methodology, for definitions of VRM classes.

[d]National Ambient Air Quality Standard shown in parentheses.

ac = acre
ac-ft/yr = acre feet per year
AUM = animal unit month
bpd = barrels per day
ft/yr = feet per year
hr = hour
ton/yr = tons per year
$\mu g/m^3$ = micrograms per cubic meter
yr = year

TABLE A-2-7
ENERCOR: GENERAL DATA

Proposed Conversion	
Number of Leases	3
Area	1,962.67 acres
Exploration	
Duration of Exploration	1 year
Drill Rigs in Use at One Time	1
Trucks to be Used	2
Trips Per Truck Per Day	4
Maximum Workers at One Time	5
Total Area Disturbed and Reclaimed	10 acres
Test Mine (including ancillary facilities)	
Total Area Disturbed	17 acres
Pilot Plant	
Synfuel Production Level	50 barrels/day
Location	Salt Lake City, Utah
Total Area Disturbed	0 (existing plant)
Commercial Operation	
Commercial Operation Life	20 years
Tar Sand Mined Over 20 Years	360 million tons
Tar Sand Mined Per Year	18 million tons/year
Synfuel Production Level	20,000 barrels/day
Water Source	Range Creek
Water Use	5,000 acre-feet/year
Peak Construction Work Force	2,500 workers
Peak Operation Work Force	800 workers
Total Area Disturbed[a]	3,000 acres

[a]For an explanation of these acreages, see analysis assumptions in Section 1.C.2.

TABLE A-2-8
ENERCOR: MAGNITUDE AND DURATION OF LAND DISTURBANCE
(acres)

	Total Surface Mine Disturbance			Acreage Disturbed at One Time	
				Duration	
Phase/Component	**Disturbed**	**Removed**	**Reclaimed**	**1 year**	**20 years**
Exploration	10[a]	0	10	1[a]	0
Commercial Operation					
Mine	1,500	0	1,500	0	400
Plant	100	100	0	0	100
Spent Sand Disposal	1,000	0	1,000	0	250
Ancillary Facilities	400	0	400	400	0
Total	3,000[b]	100	2,900	400	750[b]

[a]During the exploration phase, a total of 10 acres would be disturbed; however, since each drill site would be reclaimed upon the completion of drilling, no more than 1 acre would be disturbed at one time.

[b]Over the life of the project (before abandonment), a total of 3,000 acres would be disturbed; however, as mining progresses, no more than 750 acres would be disturbed at one time. "Acreage disturbed at one time" is defined as the total acreage in the first four stages of reclamation as shown on Figure 1-9 Chapter 1).

TABLE A-2-9
ENERCOR IMPACT SUMMARY

Resource Element	Disturbance
Number of Leases - 3	
Lease Acreage - 1,962.67 ac	
Mine Life - 20 yr	
Total Disturbance - 3,000 ac	
Water Resources	
Source	Range Creek
Acreage	5,000 ac-ft/yr
Special Watershed Management Area Disturbance	0 ac
Socioeconomics	
Peak Construction Employment	2,500
Peak Operation Employment	800
Vegetation and Soils	
Land Disturbance at One Time[a]	650 ac
Land Disturbance in Climatic Zone B	1,062 ac
Very Steep Terrain Area Disturbance[b]	1,342 ac
Wildlife	
Potential Population Reduction, Mule Deer Herd Unit 27B	1%
Area on Which Other Big Game Species Would Be Displaced	3,000 ac
Area on Which Resident Populations of Other Species Would be Lost	3,000 ac
Visual Resources[c]	
Area Significantly Affected, Class II	1,500 ac
Class III	0 ac
Class IV	100 ac
Undetermined	400 ac
Air Quality	
National Ambient Air Quality Standards	
Sulfur Dioxide[d] (3-hr)	252 $\mu g/m^3$
(24-hr)	70 $\mu g/m^3$
Annual	1 $\mu g/m^3$
Total Suspended Particulates[d] (24-hr)	163 $\mu g/m^3$
Annual	41 $\mu g/m^3$
Nitrogen Oxides[d] Annual	16 $\mu g/m^3$
Uintah and Ouray Indian Reservation	
Sulfur Dioxide (24-hr)	1 $\mu g/m^3$
Total Suspended Particulates (24-hr)	0 $\mu g/m^3$
Transportation Networks	
Level-of-Service lowered below C on US 6, SR 10, and SR 123. Increased volume and accidents.	
Agriculture	
Grazing Loss Per Year	42 AUM
Number of Allotments Affected	3
Cultural Resources	
Number of cultural resources affected cannot be known until area has been surveyed.	
Paleontology and Mineral Resources	
Paleontological Resources	Minor Loss
Resource Mined	18 million ton/yr
Oil Production	20,000 bpd

[a]Refer to Figure 2-1 in Chapter 2 showing land disturbance by year of operation.

[b]Lands with slopes exceeding 30 percent and dominated by 40 to 70 percent, including escarpments and canyon sides.

[c]Refer to Appendix A-9, Visual Resource Management Methodology, for definitions of VRM classes.

[d]National Ambient Air Quality Standard shown in parentheses.

ac = acre
ac-ft/yr = acre feet per year
AUM = animal unit month
bpd = barrels per day
ft/yr = feet per year
hr = hour
ton/yr = tons per year
$\mu g/m^3$ = micrograms per cubic meter
yr = year

TABLE A-2-10
MONO: GENERAL DATA

Proposed Conversion	
Number of Leases	7
Area	9,836.13 acres
Exploration	
Duration of Exploration	1 year
Drill Rigs in Use at One Time	2
Trucks to be Used	4
Trips Per Truck Per Day	4
Maximum Workers at One Time	12
Total Area Disturbed and Reclaimed	18 acres
Test Mine (including ancillary facilities)	
Total Area Disturbed	380 acres
Pilot Plant	
Synfuel Production Level	250 barrels/day
Location	Near Sunnyside, Utah
Total Area Disturbed	14 acres
Commercial Operation	
Commercial Operation Life	33 years
Tar Sand Mined Over 33 Years	884.4 million tons
Tar Sand Mined Per Year	26.8 million tons/year
Synfuel Production Level	30,000 barrels/day
Water Source	Green River
Water Use	9,345 acre-feet/year
Peak Construction Work Force	1,892 workers
Peak Operation Work Force	1,230 workers
Total Area Disturbed[a]	14,303 acres

[a]For an explanation of these acreages, see analysis assumptions in Section 1.C.2.

TABLE A-2-11
MONO: MAGNITUDE AND DURATION OF LAND DISTURBANCE (acres)

Phase/Component	Total Surface Mine Disturbance: Disturbed	Removed	Reclaimed	Acreage Disturbed at One Time, Duration: 1 year	33 years
Exploration	18	0	18	18	0
Commercial Operation					
Mine	4,510	0	4,510	0	650
Plant	57	57	0	0	57
Spent Sand Disposal	2,177	0	2,177	0	620
Ancillary Facilities	870	200	670	670	200
Total	7,614[a]	257	7,357	670	1,527[a]

[a]Over the life of the project (before abandonment), a total of 7,614 acres would be disturbed; however, as mining progresses, no more than 1,527 acres would be disturbed at one time. "Acreage disturbed at one time" is defined as the total acreage in the first four stages of reclamation as shown on Figure 1-9 (Chapter 1).

TABLE A-2-12
MONO IMPACT SUMMARY

Resource Element	Disturbance
Number of Leases - 7	
Lease Acreage - 9,863.13 ac	
Mine Life - 33 yr	
Total Disturbance - 14,403 ac	
Water Resources	
Source	Green River
Acreage	9,345 ac-ft/yr
Special Watershed Management Area Disturbance	2,280 ac
Socioeconomics	
Peak Construction Employment	1,800
Peak Operation Employment	1,230
Vegetation and Soils	
Land Disturbance at One Time[a]	1,270 ac
Land Disturbance in Climatic Zone B	361 ac
Very Steep Terrain Area Disturbance[b]	7,968 ac
Wildlife	
Potential Population Reduction, Mule Deer Herd Unit 27B	5%
Area on Which Other Big Game Species Would Be Displaced	14,403 ac
Area on Which Resident Populations of Other Species Would be Lost	14,403 ac
Visual Resources[c]	
Area Significantly Affected, Class II	10,830 ac
Class III	238 ac
Class IV	4,500 ac
Undetermined	870 ac
Air Quality	
National Ambient Air Quality Standards	
Sulfur Dioxide[d] (3-hr)	576 $\mu g/m^3$
(24-hr)	160 $\mu g/m^3$
Annual	8 $\mu g/m^3$
Total Suspended Particulates[d] (24-hr)	175 $\mu g/m^3$
Annual	44 $\mu g/m^3$
Nitrogen Oxides[d] Annual	67 $\mu g/m^3$
Uintah and Ouray Indian Reservation	
Sulfur Dioxide (24-hr)	1 $\mu g/m^3$
Total Suspended Particulates (24-hr)	0 $\mu g/m^3$
Transportation Networks	
Level-of-Service lowered below C on US 6, SR 10, and SR 123. Increased volume and accidents.	
Agriculture	
Grazing Loss Per Year	91 AUM
Number of Allotments Affected	9
Cultural Resources	
Number of cultural resources affected cannot be known until area has been surveyed.	
Paleontology and Mineral Resources	
Paleontological Resources	
Resource Mined	26.8 million ton/yr
Oil Production	30,000 bpd

[a]Refer to Figure 2-1 in Chapter 2 showing land disturbance by year of operation.

[b]Lands with slopes exceeding 30 percent and dominated by 40 to 70 percent, including escarpments and canyon sides.

[c]Refer to Appendix A-9, Visual Resource Management Methodology, for definitions of VRM classes.

[d]National Ambient Air Quality Standard shown in parentheses.

ac = acre
ac-ft/yr = acre feet per year
AUM = animal unit month
bpd = barrels per day
ft/yr = feet per year
hr = hour
ton/yr = tons per year
$\mu g/m^3$ = micrograms per cubic meter
yr = year

TABLE A-2-13
SABINE: GENERAL DATA

Proposed Conversion	
Number of Leases	5
Area	7,240.04 acres
Exploration	
Duration of Exploration	1 year
Drill Rigs in Use at One Time	1
Trucks to be Used	1
Trips Per Truck Per Day	4
Maximum Workers at One Time	5
Total Area Disturbed and Reclaimed	21 acres
Test Mine (including ancillary facilities)	
Total Area Disturbed	NA[a]
Pilot Plant	
Synfuel Production Level	1,000 barrels/day
Location	conversion area
Total Area Disturbed	105 acres
Commercial Operation	
Commercial Operation Life	55 years
Tar Sand Mined Over 55 Years	NA[a]
Tar Sand Mined Per Year	NA[a]
Synfuel Production Level	5,000 barrels/day
Water Source	Green River
Water Use	5,000 acre-feet/year
Peak Construction Work Force	60 workers
Peak Operation Work Force	35 workers
Total Area Disturbed[b]	6,135 acres

[a]Not Applicable. In-situ recovery operation.

[b]For an explanation of these acreages, see analysis assumptions in Section 1.C.2.

TABLE A-2-14
SABINE: MAGNITUDE AND DURATION OF LAND DISTURBANCE
(acres)

	Total In-Situ Recovery Disturbance			Acreage Disturbed at One Time	
				Duration	
Phase/Component	**Disturbed**	**Removed**	**Reclaimed**	**1 year**	**55 years**
Exploration	21	0	21	21	0
Commercial Operation					
Mine	NA[a]	NA[a]	NA[a]	NA[a]	NA[a]
Plant	6,000	0	6,000	0	1,000
Spent Sand Disposal	NA[a]	NA[a]	NA[a]	NA[a]	NA[a]
Ancillary Facilities	135	45	90	90	45
Total	6,135[b]	45	6,090	90	1,045[b]

[a]Not Applicable. Component not required for an in-situ recovery operation.

[b]Over the life of the project (before abandonment), a total of 6,135 acres would be disturbed; however, as the well field progresses, no more than 1,045 acres would be disturbed at any one time. "Acreage disturbed at one time" is defined as the total acreage in the first 4 stages of reclamation as shown on Figure 1-9 (Chapter 1).

TABLE A-2-15
SABINE IMPACT SUMMARY

Resource Element	Disturbance
Number of Leases - 5	
Lease Acreage - 7,240.04 ac	
Mine Life - 55 yr	
Total Disturbance - 6,135 ac	
Water Resources	
Source	Green River
Acreage	5,000 ac-ft/yr
Special Watershed Management Area Disturbance	680 ac
Socioeconomics	
Peak Construction Employment	60
Peak Operation Employment	35
Vegetation and Soils	
Land Disturbance at One Time[a]	1,000 ac
Land Disturbance in Climatic Zone B	0 ac
Very Steep Terrain Area Disturbance[b]	3,926 ac
Wildlife	
Potential Population Reduction, Mule Deer Herd Unit 27B	2%
Area on Which Other Big Game Species Would Be Displaced	6,135 ac
Area on Which Resident Populations of Other Species Would be Lost	6,135 ac
Visual Resources[c]	
Area Significantly Affected, Class II	1,000 ac
Class III	3,500 ac
Class IV	0 ac
Undetermined	135 ac
Air Quality	
National Ambient Air Quality Standards	
Sulfur Dioxide[d] (3-hr)	612 $\mu g/m^3$
(24-hr)	170 $\mu g/m^3$
Annual	7 $\mu g/m^3$
Total Suspended Particulates[d] (24-hr)	44 $\mu g/m^3$
Annual	12 $\mu g/m^3$
Nitrogen Oxides[d] Annual	6 $\mu g/m^3$
Uintah and Ouray Indian Reservation	
Sulfur Dioxide (24-hr)	2 $\mu g/m^3$
Total Suspended Particulates (24-hr)	0 $\mu g/m^3$
Transportation Networks	
Level-of-Service lowered below C on US 6, SR 10, and SR 123. Increased volume and accidents.	
Agriculture	
Grazing Loss,Per Year	66 AUM
Number of Allotments Affected	2
Cultural Resources	
Number of cultural resources affected cannot be known until area has been surveyed.	
Paleontology and Mineral Resources	
Paleontological Resources	Minor Loss
Resource Mined	In-Situ
Oil Production	5,000 bpd

[a]Refer to Figure 2-1 in Chapter 2 showing land disturbance by year of operation.

[b]Lands with slopes exceeding 30 percent and dominated by 40 to 70 percent, including escarpments and canyon sides.

[c]Refer to Appendix A-9, Visual Resource Management Methodology, for definitions of VRM classes.

[d]National Ambient Air Quality Standard shown in parentheses.

ac = acre
ac-ft/yr = acre feet per year
AUM = animal unit month
bpd = barrels per day
ft/yr = feet per year
hr = hour
ton/yr = tons per year
$\mu g/m^3$ = micrograms per cubic meter
yr = year

APPENDIX A-3

EXISTING OIL AND GAS PROVISIONS AND REQUIRED GENERAL MEASURES DESIGNED TO REDUCE IMPACTS

The impact analysis presented in this EIS assumed compliance with mitigation measures that likely would be rewritten as stipulations attached to federal or state authorizations. This agency-committed mitigation falls into two categories—provisions of the existing oil and gas leases that could be carried forward, in some form, as part of a new combined hydrocarbon lease; and general measures typically included in agency authorizations for projects similar to the ones studied in this EIS.

EXISTING OIL AND GAS PROVISIONS

Under the conversion regulations (47 CFR 3140.4-2), a combined hydrocarbon lease will contain all appropriate terms and conditions required to ensure compliance with the plan of operations, including any necessary stipulations that were part of the original oil and gas lease being converted. General provisions of an oil and gas lease that could be carried forward should a lease be converted are identified below. However, the actual stipulations that would be included for a specific combined hydrocarbon lease would be determined on a case-by-case basis.

1. The lessee shall submit in writing to the BLM District Manager for advance written approval, a detailed plan of operations, which will discuss any operation that could result in property damage, land disturbance, or induce erosion, including any planned use of earth-moving or similar mobile equipment. Operations that will be discussed in the plan include, but are not limited to, exploratory drilling, construction of access roads, and seismographic explorations.

2. Any drilling, construction, or other operation on the leased lands that will disturb the land surface or otherwise affect the environment shall be subject to prior approval by the BLM.

3. Activities on the lease shall be done in accordance with applicable regulations, including such requirements as the BLM may prescribe as necessary to prevent environmental damage.

REQUIRED GENERAL MEASURES DESIGNED TO REDUCE IMPACTS

As a condition of granting any lease conversions and/or other authorizations, the various agencies would require that certain terms and conditions are met. Some of these general measures are presented in this appendix. As project plans are finalized and before specific authorizations are given, additional specific requirements would be added by the various authorizing agencies, including a wildlife mitigation plan developed jointly by the Utah Division of Wildlife Resources (UDWR), Bureau of Land Management (BLM), Forest Service (FS), and the applicants.

The federal government has mandates to protect: threatened and endangered species and their critical habitat; historical, archaeological and paleontological resources; and wild horses and burros. Also, there are mandates to protect areas currently being managed to protect their potential for classification as wilderness areas. Other areas having special designation must also be protected. It is also assumed that sufficient funding and manpower would be available to properly enforce the required mitigating measures herein.

Authority for mitigation of loss of vegetation, livestock forage, wildlife habitat, archaeological and paleontological values, and a reduction in water and air quality, aesthetics, and recreation on federal lands, is granted under the following acts:

Organic Administration Act of 1897
Reclamation Act of 1902
Preservation of American Antiquities Act of 1906
Wilderness Act of 1964
Historic Preservation Act of 1966
Executive Order 11593 of 1971 (Protection and Enhancement of the Cultural Environment)
Archaeological and Historical Data Preservation Act of 1974

Federal Land Policy and Management Act of 1976
The Clean Air Act as Amended of 1977
The Federal Clean Water Act of 1977
Endangered Species Act as Amended 1978
Executive Order 12088

Federal regulatory agencies would also require compliance with safety and noise level regulations imposed by the Occupational Safety and Health Act of 1970; with the Federal Aviation Administration clearance standards, granted under authority of the Federal Aviation Act of 1958; and with grounding and clearance requirements of the National Electric Safety Code.

As future conditions may result in project plan refinement or adjustment, all mitigating measures outlined here could be modified as deemed desirable within authorized limits by the appropriate federal official.

Should future off-lease rights-of-way be necessary on federal lands, further environmental analysis would be conducted with a future right-of-way grant, a Construction, Operation, and Maintenance (COM) plan, or similar document would be prepared covering the construction of all project facilities on federal land. This plan would be submitted for approval to the authorizing agency prior to commencement of work on the ground. The COM plan would contain the following sections on site-specific stipulations: (Because the various actions would be composed of many types of terrain, soils, vegetation, land uses, and climatic conditions, the sections within the COM plan would include sets of techniques and measures tailored to each condition encountered).

- Fire Protection
- Clearing - Visual Resources
- Erosion Control, Revegetation, and Restoration—specific guidelines for the Erosion Control, Revegetation, and Restoration Section of the COM plan are included in this EIS as Appendix A-7, Reclamation and Erosion Control Programs
- Transportation
- Communications
- Cultural Resources
- Threatened and Endangered Studies and Mitigation (including a wildlife mitigation plan developed jointly by UDWR, BLM, FS, and the applicant)
- Blasting
- Pesticide and Herbicide Use
- Health and Safety
  - a. Solid Waste
  - b. Emergency Response
  - c. Air Quality
  - d. Transportation
- Site Prescription
- Right-of-Way Maintenance and Monitoring

Technical assistance and approval of written plans for federal lands would be obtained from the BLM, prior to any construction.

Under authority of Section 504 of the Federal Land Policy and Management Act (FLPMA), the applicants would be required to provide funding to the appropriate federal agencies for the purpose of financing one or more specialists for administration of construction activities.

BUREAU OF LAND MANAGEMENT

GENERAL

1. All state and federal regulations and laws will be complied with.

2. All activities associated with the projects will be conducted in a manner that will avoid or minimize degradation of air, land, and water quality. In the construction, operation, maintenance, and abandonment of the projects, activities will be performed in accordance with applicable air and water quality standards, and related plans of implementation, including but not limited to, the Clean Air Act, as amended (42 USC 1321) and the Clean Water Act (USCA 1251).

3. Permittees and other regular users of public lands affected by construction of the projects will be notified in advance of any construction activity that may affect their businesses or operations. This will include, but not be limited to, signing of temporary road closures, notification of proposed removal and/or cutting of fences, and disturbances to range improvements or other use-related structures.

TRANSPORTATION

1. A transportation plan will be submitted as part of the COM plan. This plan will cover approval of temporary, reconstructed, and newly constructed roads and will include clearing work, signing, rehabilitation, and uses associated with transportation needs. Overland access could be specified in lieu of road construction or reconstruction.

2. Access roads necessary for operation and maintenance of the projects will be clearly identified. Some of these access roads may be designated by the authorizing agency as open for public use, including but not limited to, off-road vehicular (ORV) travel.

3. Helicopters will be used to string pipe and deliver equipment in areas where access due to the terrain or management constraints preclude standard construction.

4. Portions of the lease conversion and other authorized areas for use will be used as access roads only when necessary and only during the construction period. The temporary access roads will be closed and vegetative cover reestablished after construction is completed. No maintenance roads along linear facilities will be permitted.

5. The applicants will control ORV use within the lease conversion areas. Such specified control could include use of physical barriers, replanting trees, or other reasonable means of ORV control.

6. Gates or cattle guards on established roads on public land will not be locked or closed by the applicants.

LAND USE

1. Disturbance of improvements such as fences, roads, and watering facilities during construction, operation, and maintenance must be kept to an absolute minimum. Immediate restoration to any damage of improvements to at least their former state will be required. Functional use of these improvements must be maintained at all times. When necessary to pass through a fence line, the fence shall be braced on both sides of the passageway prior to cutting of the fence. A gate acceptable to the authorizing agency official shall be installed in the gate opening and kept closed when not in actual use. Where a permanent road is to be constructed or maintained, cattleguards shall be placed at all fence crossings.

2. If a natural barrier used for livestock control is broken during construction, the applicants will adequately fence the area to prevent drift of livestock. Fence specifications will be determined on a case-by-case basis.

WATER

1. All river, stream, and wash crossings required for access to project facilities will be at existing roads or bridges, except at locations designated by the authorizing agency official. Culverts or bridges will be installed at points where new permanent access roads cross live streams to allow unobstructed fish passage. Where temporary roads cross drainages or dirt fills, culverts will be installed and removed upon completion of the project. Any construction activity in a perennial stream is prohibited unless specifically allowed by the authorizing agency official. All stream channels and washes will be returned to their natural state.

2. Construction plans for crossing streams by boring, driving, or trenching will be approved by the authorized officer.

3. A buffer strip of terrestrial vegetation above the high water line will be left between work areas adjacent to the stream and the stream itself.

4. In streams, construction will be planned to coincide with low water flows.

5. The applicant will complete the work and return the stream to its natural state as soon as possible.

6. Stream banks will be returned, as nearly as possible, to their original condition.

7. Backfill material for the pipe in the streambed will be of predominantly course material.

WASTE

1. Construction equipment must be refueled and maintained outside of stream channels in areas designated by the authorizing agency official.

2. Garbage and other refuge will be disposed in an authorized disposal site or landfill. Engine oil changed on federal lands will be contained in suitable containers and disposed as refuse; no fuel, oil, or other hydrocarbon spills are permitted. If such a spill accidentally occurs, the authorized officer would be notified immediately and corrective measures undertaken as directed.

3. Within 30 days after conclusion of construction and operation, all construction materials and related litter and debris shall be disposed in accordance with instruction of the authorized officer.

VEGETATION

1. Vegetation cleared during construction, operation, maintenance, or other activity will be disposed of as directed.

2. Commerical tree species cut will be measured and paid for.

3. Disturbed areas, which in the opinion of the authorizing agency are unsuitable for successful revegetation, shall be protected under the reclamation, erosion control, and revegetation provisions of the COM plan. This plan shall state the method of protection to be used and the provisions for prevention of site deterioration and introduction of noxious weeds. At a minimum, the COM plan will include the reclamation, erosion control, and revegetation items decribed in Appendix A-7 for all federal land.

3. Preclearing of mountain brush and tree-covered areas prior to dozer and maintenance blade work will be required.

SOILS

1. Existing soils and geological data will be gathered and used to achieve maximum revegetation and soil erosion mitigation responses.

2. Areas subject to mudflows, landslides, mudslides, avalanches, rock falls, and other types of mass movement will be avoided where practical in locating linear facilities. Where such avoidance is not practical, the design, based upon detailed field investigations and analysis, will provide measures to prevent the occurrence of mass movements.

3. All topsoil and suitable plant growth material on federal lands will be conserved for reclamation requirements; excess topsoil will be stockpiled at designated locations.

4. All disturbed areas shall be landscaped and revegetated as nearly as possible to their original conditions or to a condition agreed upon by both the applicant and the authorizing agency official. This reclamation shall be accomplished as soon as possible after the disturbance occurs.

5. The reestablishment of vegetative cover and establishment of watershed stabilization measures will be completed during the ongoing working season and prior to the next winter season.

6. Trees and brush (indigenous species) will be established according to the revegetation, erosion control, and rehabilitation plan contained within the COM plan.

7. In areas where soil surface had been modified or natural vegetation had been removed, noxious weeds will be controlled.

8. Clearing for linear facilities in timber areas to reduce fire hazard will be limited to the lease conversion or other authorized area. Stumps will not be higher than 6 inches. The trees will be limbed and stacked adjacent to the edge of the clearing. Slash will be spread over the area or designated by the authorized officer.

9. Fire control provisions will be included in the COM plan. The applicant shall do everything reasonably possible, both independently and upon request of the authorized officer, to prevent and suppress fires on or in the immediate vicinity of the lease conversion area. This includes making available such construction, operation, and maintenance force as may be reasonably obtained for the suppression of fires.

VISUAL RESOURCES

1. A plan to minimize visual impacts will be required as a part of the COM plan. The applicants will design and locate the lease conversion elements to blend into the existing environment so as to most nearly meet the minimum degree of contrast acceptable for the Visual Resource Management class in which the structures would be located. The authorizing agency will evaluate and approve measures before construction begins.

2. Edges of vegetative clearings will be feathered where feasible to avoid straight lines.

CULTURAL RESOURCES

All significant cultural resources identified on the project area will be avoided wherever possible. For significant cultural resources that cannot be avoided, a Memorandum of Agreement with the Advisory Council on Historic Preservation and the Utah State Historic Preservation Office will be developed that details specific mitigation measures in accordance with 36 CFR 800. All cultural resources discovered during construction that were not previously identified will be left undisturbed until they can be evaluated for significance.

PALEONTOLOGY

The applicant will provide a qualified paleontologist who is approved by the authorizing officer. The paleontologist will conduct an intensive survey of all areas to be disturbed according to the significance and mitigation needs specified by the applicants. The paleontologist will be available, as needed, during surface disturbance. If in the opinion of the paleontologist, paleontological values specified by the applicants would be disturbed, construction will be halted until appropriate action could be taken.

WILDLIFE

1. Development of the proposed lease conversions may have an effect on threatened or endangered species. However, the current project descriptions do not contain sufficient information to make a full determination as to whether or not the eventual developments would jeopardize the continued existence of any of the threatened or endangered species found in the region. This is particularily so for eventual water use from the Colorado River system in relation to endangered fish species. Therefore, it would be necessary for BLM to request Section 7 (Endangered Species Act) consultation with the Fish and Wildlife Service (FWS) on a project-by-project basis as each plan of operations is reviewed for approval. Each converted lease would contain the following special provision in order to avoid a Section 7 jeopardy biological opinion:

"The lessee shall develop a detailed plan of operations which will fully protect listed or proposed threatened or endangered species and shall submit the plan to BLM for formal consultation with FWS as required by Section 7 of the Endangered Species Act. The plan must cover species occurring on site as well as those off-site species which may be adversely impacted. Consultation must be completed prior to the irreversible or irretrievable committment of resource or funds for on-the-ground development.

This lease is issued and accepted with the express agreement that such consultation may require adjustments to the plan of operations, addition of special conservation measures, or limitations to the project in order to assure compliance with such provisions of the Endangered Species Act as may be applicable as determined by FWS at the time of development."

2. Any active golden eagle nest found within 1 mile of project activities will have to be protected from harassment during the critical nesting period in accordance with provisions established by the Bald Eagle Protection Act.

PESTICIDES

Applicable federal and state laws and regulations concerning the use of pesticides (i.e., insecticides, herbicides, fungicides, rodenticides, and other similar substances) will be complied with in all activities and operations. The applicants will obtain program approval from the authorizing agency prior to the use of such substances. The program request will provide the type and quantity of material to be used; the pest, insect, fungus, etc., to be controlled;

the method of application; the location of storage and disposals of containers; and other information that may be required. The request will be submitted no later than December 1 of the calendar year prior to the start of the fiscal year that the activities are proposed (i.e., December 1, 1984, deadline for a fiscal year 1985 action). Emergency use of pesticides will be approved by the authorizing agency. A pesticide will not be used if the Secretary of the Interior or Agriculture has prohibited its use. A pesticide will only be used in accordance with its registered uses and with other Secretarial limitations. Pesticides will not be permanently stored on federal lands.

CORPS OF ENGINEERS

The Corps of Engineers (COE) has prescribed management practices that will be followed to the maximum extent practical, for discharges covered by the Nationwide Permit (items 1 through 8 below). Additionally, certain conditions (33 CFR 330) must be met under the Nationwide Permit authority (items 9 through 17 below). For further detail, please refer to the COE Permit Program "A Guide For Applicants," November 1, 1977.

1. Discharges of dredged or fill material into United States water will be avoided or minimized through the use of other practical alternatives.

2. Discharges in spawning areas during spawning seasons will be avoided.

3. Discharges will not be allowed to restrict or impede the movement of aquatic species indigenous to the waters, impede the passage of normal or expected high flows, or cause the relocation of the waters (unless the primary purpose of the fill is to impound waters).

4. If the discharge creates an impoundment water, adverse impacts on the aquatic system caused by the accelerated passage of water and/or the restriction of its flow will have to be minimized.

5. Discharges in wetland areas will be avoided.

6. Heavy equipment working in wetlands will be placed on mats.

7. Discharges into breeding and nesting areas for migratory waterfowl will be avoided.

8. All temporary fills will be removed in their entirety.

9. There cannot be any change in preconstruction bottom contours. (Excess material will be removed to an upland disposal area.)

10. The discharge cannot occur in the proximity of a public water supply intake.

11. The discharge cannot occur in areas of concentrated shellfish production.

12. The discharge cannot destroy a threatened or endangered species as identified under the Endangered Species Act or endanger the critical habitat of such species.

13. The discharge cannot disrupt the movement of those species of aquatic life indigenous to the waterbody.

14. The discharge will consist of suitable material free from toxic pollutants in other than trace quantities.

15. The fill created by a discharge will be properly maintained to prevent erosion and other nonpoint sources of pollution.

16. The discharge will not occur in a component of the National Wild and Scenic River System or in a component of a State Wild and Scenic River System.

17. No access roads, fills, dikes, or other structures will be constructed below the ordinary high water level of the streams under the Nationwide Permit. These structures would require separate Section 404 permits.

STATE OF UTAH

1. Each applicant is required by **Utah Code Annotated** Section 63-51-10 (Supp. 1981) to submit a financial impact statement and plan to alleviate socioeconomic impacts. Approval of each applicant's plan will be required before issuance of any state permits required to start construction.

2. The Utah Division of Oil, Gas, and Mining (UDOGM), within the Department of Natural Resources and Energy, has responsibility for issuance of permits or approval letters for intention to commence mining operations for noncoal minerals excluding sand and gravel operations, under the authority of the Utah Mined Land Reclamation Act, 1975. The purpose of this permit is to ensure protection of the environment prior, during, and following mining activities.

Operation requirements:
- mine development and reclamation must proceed in accordance with the approved plan
- an annual report (Form MR-3) must be filed every year.

3. The Utah Division of State Lands and Foresty (UDSLF), within the Department of Natural Resources and Energy, has responsibility for issuance of Right-of-Way/Right-of-Entry permits, under the authority of **Utah Code Annotated**, 1953, Title 65. The purpose of this permit is to protect the environment and prevent illegal entry to state lands.

Operations Requirements:
- Following approval, permittee must fully comply with all stipulations.
- Federal specifications shall apply to the state lands where federal lands are also involved and a federal permit for a right-of-way has been granted.

4. The Utah Division of Environmental Health (UDEH), Bureau of Air Quality, within the Department of Health, has responsibility for approval of air pollution sources, under the authority of the Utah Air Conservation Act. The purpose of this permit is to prevent air pollution by any air pollution source except comfort heating.

Operations Requirements:
- No operating permit is required.
- Periodic inspection must be completed to ensure compliance with permit requirements.
- Periodic source testing at the sources expense.

5. The UDEH, Bureau of Hazardous Wastes and Radiation, within the Department of Health, has responsibility for approval of plans for hazardous waste management, treatment, storage and/or disposal facilities, under the authority of the Utah Solid and Hazardous Waste Act. The purpose of the permit is to prevent faulty construction of these facilities which may constitute hazardous conditions.

Operations Requirements:
- Following approval, the owner or operator of a facility complies with the conditions of the plan approval and the requirements of the Utah Hazardous Waste Management Regulations.

APPENDIX A-4
UNCOMMITTED MITIGATION MEASURES

The following mitigation measures were identified during the process of impact analysis to further alleviate or minimize potential environmental effects from the proposed developments. However, these measures are not committed to by the federal agencies or the applicants. These additional mitigation measures are presented as additional information and for use by the applicants as voluntary implementation or by authorizing officials in eventual permit stipulation. These uncommitted mitigation measures are presented below by resource topic. For those resources not listed, refer to the appropriate appendix for additional measures.

WATER

1. Clean sediment from all detention ponds after spring runoff, significant storms, and prior to winter.

2. Develop springs (installation of horizontal drain) to augment flow.

3. Treat excess process water and waters originating from the mined areas to maintain quality at preproject levels.

SOCIOECONOMICS

Each applicant is required by **Utah Code Annotated** Section 63-51-10 (Supp. 1981) to submit a financial impact statement and plan to alleviate socioeconomic impacts. Approval of each applicant's plan would be required before issuance of any state permits required to start construction. The following items should be considered for inclusion in such a plan.

1. Single family homes, trailer sites, and mobile homes could be provided for sale or lease to employees at an affordable cost in order to mitigate expected housing shortage.

2. The sale of housing units that would be constructed by local developers could be formally guaranteed in order to provide an incentive for increased housing.

3. Rental commitments of units that would be constructed by local developers also could be formally guaranteed in order to provide an increased supply of housing.

4. Funds for local planning positions could be provided in order to allow careful planning and mitigation of community impacts.

5. Funding for certain service positions such as policemen or social workers could be provided in order to encourage an adequate supply.

6. Low interest loans with delayed payments could be provided until revenue increase. This would eliminate the problem of lag time between when community expenditures are needed and when the increased revenues begin.

7. Establish a housing office to help place workers in available housing units.

8. The proposed synfuels projects establish procedures that could include creation of a job training program. Such aid would be used to support (1) relevant vocational skills training, and (2) adoption of an affirmative action hiring plan.

9. Monitoring of work camp populations and policies to ensure that assumed occupancy occurs could be incorporated into the mitigation planning required by Utah law (S.B. 170).

WILDLIFE

1. In areas of crucial wildlife habitat, initiate range improvement practices to increase carrying capacities in adjacent areas prior to habitat disturbances by tar sand development.

2. Initiate training and educational programs to acquaint company personnel with wildlife programs

and the need for firearm control in order to create a greater respect for wildlife and reduce poaching.

3. Increase the forage productivity of lands adjacent to areas committed to irreversible commitment of resources to make up for acres lost.

4. During peak years of construction and operation, the companies could jointly finance two additional temporary Wildlife Conservation Officers (Game Wardens) for the local region. After construction declines, one permanent officer could be funded for the life of the project or as determined by UDWR.

5. The companies and their contractors could consider conviction of a job-related game violation as grounds for dismissal.

6. Guns could be prohibited on all project sites.

7. Mitigation measures dealing with the increase in the regional human population could include limiting the number of hunting licenses, modification of hunting and fishing season lengths, imposition of smaller bag limits, limited quota hunting, increased stocking of local streams and stricter enforcement of existing game and fish laws. These measures, if implemented, could control, but not eliminate significant secondary impacts to wildlife.

8. The following baseline studies are essential to help mitigate wildlife resource losses in the Sunnyside area:

STUDY DESCRIPTION: MULE DEER MIGRATION AND MOVEMENT CORRIDOR IDENTIFICATION/TELEMETRY STUDY

Justification: Migration corridors between summer and winter range have not been identified. Disruption of these traditional routes could cause large habitat areas (summer and winter) to be inaccessible by mule deer. Impacts to small areas could potentially impact much larger areas.

Movement corridors within the summer range may be as important as migration corridors between summer and winter range. With potential development, the scale proposed for tar sands, disruption of movement corridors could make inaccessible significant portions of the summer range.

STUDY DESCRIPTION: MULE DEER FAWNING AREA IDENTIFICATION/TELEMETRY STUDY

Justification: Fawning areas have not been identified. These areas consist of a unique combination of forage, cover, and water which is often limiting. Loss of these habitat types would cause much greater impacts than if a similar acreage of another habitat.

STUDY DESCRIPTION: SAGE GROUSE STRUTTING GROUND INVENTORY/AERIAL SURVEY

Justification: Six strutting grounds have been identified in the affected area. However, due to poor accessibility to the areas where strutting activity would occur and the presence of highly suitable habitat where strutting grounds have not been identified, it is believed an aerial survey is warranted.

STUDY DESCRIPTION: RAPTOR NESTING INVENTORY (RAPTOR SPECIES OF HIGH FEDERAL INTEREST)/AERIAL SURVEY

Justification: Two golden eagle nest sites have been identified in the affected area. However, these nests were opportunistic sitings. No raptor inventory has been conducted in the affected area. The known golden eagle nests are a demonstration that suitable habitat exists and an inventory is warranted.

STUDY DESCRIPTION: AQUATIC SPECIES INVENTORY ON UPPER DRY CREEK/ELECTROSHOCKING SURVEY

Justification: Based on observations made in 1981, it is believed the portion of Dry Creek which crosses the tract is perennial. A potential cold water fishery exists. Due to the isolation of this portion of Dry Creek, Colorado Cutthroat, a BLM sensitive species, could occur.

VISUAL RESOURCES

ROADS

1. Utilize existing roads, as much as possible, to maintain the existing quality of the visual resource and lessen other environmental impacts.

2. When constructing new roads or rebuilding existing roads, minimize the width of roads, keeping safety in mind, to lessen the impact on the visual resource and other resource values.

3. Keep road cuts and fills to a minimum when constructing new roads or upgrading existing areas to minimize the contrast in landform modification and contrast for visual resource.

4. Double cut ends of culverts to match the road cut slopes, or use preformed end section, when installing culverts for roads in visually high or medium sensitive areas to reduce the visual contrast when adding a structure to the landscape.

TRANSMISSION/DISTRIBUTION LINES

1. Do not clear vegetation for transmission line construction unless the existing vegetation would directly interfere with construction or operation of the structures in high or medium visually sensitive areas. Lessened clearing would reduce the vegetative contrasts in form, line, color, and texture with the natural landscape.

2. Where possible, connect vegetative clearings for transmission line construction and operation with existing natural clearings, even if extra clearing would be reasonably necessary, to reduce the form, line, color, and texture or the contrast with the natural landscape vegetation.

3. Preplan transmission line corridors to lessen introduced visual contrasts of the structures with the existing visual landscape by screening or blending the transmission line characteristics where possible.

FACILITIES

1. Choose building materials, colors, and overall designs for facilities in high or medium visual sensitivity areas to help the facility blend with the surrounding landscape.

2. Locate facilities when possible to minimize visual contrast by taking advantage of landforms, vegetative pattern, etc.

3. Where feasible, remove and save topsoil for redistribution when constructing facilities so that the site may more easily revegetate when construction is complete.

4. Minimize vegetation removal when constructing facilities, or in a few cases, clear additional vegetation to blend clearings with existing landscape conditions and help reduce visual contrast.

PIPELINES

1. Pipeline (or conveyor) clearings should be natural in appearance, blending with natural vegetative clearings and patterns, or where possible place pipeline along side existing roads, to minimize visual contrast with the natural landscape.

2. In areas where subsoil colors are different than surface soil colors and the visual sensitivity is high or medium, use proper trenching and backfill techniqus to replace soils so color contrasts do not result in lessening the visual quality of an area.

MISCELLANEOUS

1. Where feasible, revegetate with indigenous plants, using on-site transplants, as an example, to help avoid long-term visual contrasts with the natural landscape. (For more information on revegetation, refer to Appendix A-7, Reclamation and Erosion Control Programs.)

2. Plan uniformity in signing (highway, recreational, informational) to reduce visual contrasts by establishing harmony in signing.

TRANSPORTATION NETWORKS

1. Where feasible, implement a comprehensive ride sharing program that would include the use of car pools, van pools, and buses to transport construction and operation workers.

2. Stagger work hours.

3. Construct signal lights at the high volume traffic intersections—State Road (SR) 123 and SR 124; SR 123 and US 6.

4. Where major public access routes are blocked by development activities, the applicants could be required to provide alternative access routes.

AGRICULTURE

CROPLAND

Where possible, avoid building homesites and other support facilities to accommodate the project-related population increases on irrigated cropland. This would minimize the impact of cropland conversion to urban uses.

APPENDIX A-5
WATER RESOURCES

SPECIAL WATERSHED MANAGEMENT AREAS AND RELATED REGULATIONS

Within the main block of the Sunnyside Special Tar Sand Area (STSA) are 4 special watershed management areas (Map 3-1, map pocket). These areas have been withdrawn, or restricted from certain types of uses, to protect the water resources of the area. The special watershed management areas are:

- 2,400 acres of public lands set aside as a water supply reserve for Sunnyside, Utah. Authorized by Public Law No. 294, January 7, 1921.
- 3,680 acres of public lands withdrawn as a public water reserve. Authorized by Order of Withdrawal No. 16, March 14, 1916.
- 2,000 acres of Range Creek Watershed, designated by the Bureau of Land Management (BLM) as an area containing topographic features and water resources worthy of protection from surface disturbance.
- 1,440 acres of Bear and Rock Creeks Watershed designated by the BLM as an area containing topographic features and water resources worthy of protection from surface disturbance.

January 7, 1921.
[S. 46.]
[Public, No. 294.]

CHAP. 13.—An Act For the protection of the water supply of the town of Sunnyside, Utah.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the public lands within the several townships and subdivisions thereof hereinafter enumerated, situated in the county of Carbon and State of Utah, are hereby reserved from all forms of location, entry, or appropriation, whether under the mineral or nonmineral land laws of the United States, and set aside as a municipal water-supply reserve for the use and benefit of the people of the town of Sunnyside, a municipal corporation of the State of Utah, as follows, to wit: The south half of south half of section thirty-four, in township thirteen south, range fourteen east, Salt Lake base and meridian; and also the following lands which, when surveyed, will be described as follows, to wit: All of section eleven; west half of section twelve; all of section thirteen; and all of section fourteen, in township fourteen south, range fourteen east, of Salt Lake base and meridian.

Public lands. Set aside as water-supply reserve for Sunnyside, Utah.

Description.

Sec. 2. That the lands heretofore described and reserved for municipal water-supply purposes shall be administered by the Secretary of the Interior, in cooperation with and at the exclusive expense of the town of Sunnyside, Utah, for the purpose of storing, conserving, and protecting from pollution the said water supply, and preserving, improving, and increasing the timber growth on said lands, to more fully accomplish such purposes; and to that end said municipality shall have the right, subject to the approval of the Secretary of the Interior, to the use of any and all parts of the lands reserved for the storage and conveying of water and construction and maintenance thereon of all improvements for such purposes: *Provided,* That deposits of coal or other minerals in the lands reserved by this Act may be leased or otherwise disposed of by the Secretary of the Interior under laws applicable to such deposits, if and when he shall find that same may be mined and removed without injury to the municipal water supply of Sunnyside, Utah.

Secretary of the Interior to cooperate in administration, etc., of.

Rights conferred.

Proviso. Mineral deposits.

Sec. 3. That the said Secretary of the Interior is hereby authorized to prescribe and enforce such regulations as he may find necessary to carry out the purpose of this Act, including the right to forbid persons other than those authorized by him and the municipal authorities of said municipal corporation from entering or otherwise trespassing upon these lands, and any violation of this Act or of regulations issued thereunder shall be punishable as is provided for in section 50 of the Act entitled "An Act to codify, revise, and amend the penal laws of the United States, approved March 4, 1909" (Thirty-fifth Statutes at Large, page 1098), as amended by the Act of Congress approved June 25, 1910 (Thirty-sixth Statutes at Large, page 857).

Regulations, etc.

Enforcement. Vol. 35, p. 1098.

Vol. 36, p. 857.

Sec. 4. That this Act shall be subject to all legal rights heretofore acquired under any law of the United States, and the right to alter, amend, or repeal this Act is hereby expressly reserved.

Prior rights, etc., reserved.

Approved, January 7, 1921.

January 7, 1921.
[S. 429.]
[Public, No. 295.]

CHAP. 14.—An Act To authorize an exchange of lands with Henry Blackburn.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior is hereby authorized to accept title to the southwest quarter of the southeast quarter of section nineteen, township thirty-nine south, range six west, Salt Lake meridian, and to convey in exchange therefor to Henry Blackburn, of Orderville, Utah, title to the northeast quarter of the northeast quarter of section thirty, township

Sevier National Forest, Utah. Lands exchanged with Henry Blackburn for.

ORDER OF WITHDRAWAL 1218780-1

PUBLIC WATER RESERVE NO. 107

Under and pursuant to the provisions of the act of Congress approved June 25, 1910 (36 Stat., 847), entitled "An act to authorize the President of the United States to make withdrawals of public lands in certain cases", as amended by act of Congress approved August 24, 1912 (37 Stat., 497), it is hereby ordered that every smallest legal subdivision of the public land surveys which is vacant unappropriated unreserved public land and contains a spring or water hole, and all land within one quarter of a mile of every spring or water hole located on unsurveyed public land be, and the same is hereby, withdrawn from settlement, location, sale, or entry, and reserved for public use in accordance with the provisions of Sec. 10 of the act of December 29, 1916 (39 Stat., 862), and in aid of pending legislation.

[signature]
President.

April 17 1926.

STATE OF UTAH WATER CLASSIFICATION

2.6 USE DESIGNATIONS

The Committee and Board, as required by 73-14-6 and 63-46-1 through 13, Utah Code Annotated 1953, as amended, shall group the waters of the state into classes so as to protect against controllable pollution the beneficial uses designated within each class as set forth below. Waters of the state are hereby classified as shown below.

2.6.1 Class 1—protected for use as a raw water source for domestic water systems.

A. Class 1A—protected for domestic purposes without treatment.

B. Class 1B—protected for domestic purposes with prior disinfection.

C. Class 1C—protected for domestic purposes with prior treatment by standard complete treatment processes as required by the Utah State Division of Health.

2.6.2 Class 2—protected for in-stream recreational use and aesthetics.

A. Class 2A—protected for recreation bathing (swimming).

B. Class 2B—protected for boating, water skiing, and similar uses, excluding recreational bathing (swimming).

2.6.3 Class 3—protected for in-stream use by beneficial aquatic wildlife.

A. Class 3A—protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain.

B. Class 3B—protected for warm water species of game fish and other water water aquatic life, including the necessary aquatic organisms in their food chain.

C. Class 3C—protected for non-game fish and other aquatic life, including the necessary aquatic organisms in their food chain. Standards for this class will be determined on a case-by-case basis.

D. Class 3D—protected for waterfowl, shorebirds, and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain.

2.6.4 Class 4—protected for agricultural uses including irrigation of crops and stockwatering.

2.6.5 Class 5—protected for industrial uses including cooling, boiler make-up, and others with potential for human contact or exposure. Standards for this class will be determined on a case-by-case basis.

2.6.6 Class 6—protected for uses of waters not generally suitable for the uses identified in Sections 2.6.1 through 2.6.5, above. Standards for this class will be determined on a case-by-case basis.

2.7 WATER QUALITY STANDARDS

2.7.1 Application of Standards

The standards listed in the **Wastewater Disposal Regulations** (State of Utah 1978) shall apply to each of the classes assigned to waters of the State as specified in Section 2.6 of these regulations. It shall be unlawful and a violation of these regulations for any person to discharge or place any wastes or other substances in such manner as may interfere with designated uses by assigned classes or to cause any of the applicable standards to be violated, except as provided in Section 1.3.1.

2.7.2 Narrative Standards

It shall be unlawful, and a violation of these regulations, for any person to discharge or place any waste or other substance in such a way as will be or may become offensive such as unnatural deposits, floating debris, oil, scum, or other nuisance such as color, odor, or taste; or conditions which produce undesirable aquatic life or which produce objectionable tastes in edible aquatic organisms; or

concentrations or combinations of substances which produce undesirable physiological responses in desirable resident fish, or other desirable aquatic life, as determined by bio-assay or other tests performed in accordance with standard procedures determined by the Committee.

2.8 PROTECTION OF DOWNSTREAM USES

All actions to control waste discharges under these regulations shall be modified as necessary to protect downstream designated uses.

2.9 INTERMITTENT WATERS

Failure of a stream to meet water quality standards when stream flow is either unusually high or less than the 7-day, 10-year minimum flow shall not be cause for action against persons discharging wastes which meet both the requirements of PART I of these regulations and the requirements of PART I of these regulations and the requirements of applicable permits.

2.10 LABORATORY AND FIELD ANALYSES

2.10.1 Laboratory Analyses

All laboratory examinations of samples collected to determine compliance with these regulations shall be performed in accordance with standard procedures by the Utah Division of Health Laboratories or by a laboratory certified by the Utah Division of Health.

2.10.2 Field Analyses

All field analyses to determine compliance with these regulations shall be conducted in accordance with standard procedures specified by the Utah Division of Health.

2.11 PUBLIC PARTICIPATION

Public hearings will be held to review all proposed revisions of water quality standards, designations and classifications, and public meetings will be held for case-by-case consideration of discharge requirements set to protect water uses under assigned classifications. All meetings shall comply with the provisions of Section 63-46-1 through 13, **Utah Code Annotated** 1953, as amended.

DETERMINATION OF CURRENT SEDIMENTATION RATE IN GRASSY TRAIL RESERVOIR

- Drainage area 17.2 square miles (mi^2)

- Reservoir capacity 55 acre-feet (ac-ft) sediment storage plus 861 ac-ft water capacity equals total of 916 ac-ft

- Built and filled in 1952, 30 years old

- Sediment density, 70 pounds per square foot

- Trap efficiency:

reservoir capacity in WS inches =

$$0.08175 \times \frac{916 \text{ ac-ft}}{17.2 \text{ mi}^2 \text{ drainage area}} = 4.35$$

average runoff in WS inches = 6" Hydrologic Inventory of Price River Study Unit, 1975, Utah Division of Natural Resources, Division of Water Resources

capacity/inflow ratio, C/I = 4.35 - 6 = 0.73

- currently has 200 ac-ft of sediment (Utah Fish and Game Survey 1981)

Sediment Trapped Per Year

200 ac-ft sediment - 29 years = 6.9 ac-ft/yr

6.9 x 43,560 = 300,564 ft^3/yr x 70 lbs/ft^3 = 21,039,480 lbs - 2000 = 19,520 ton/yr

Sediment Delivered Per Year

If 10,520 = 80%, then 100% = 1,350 ton/yr

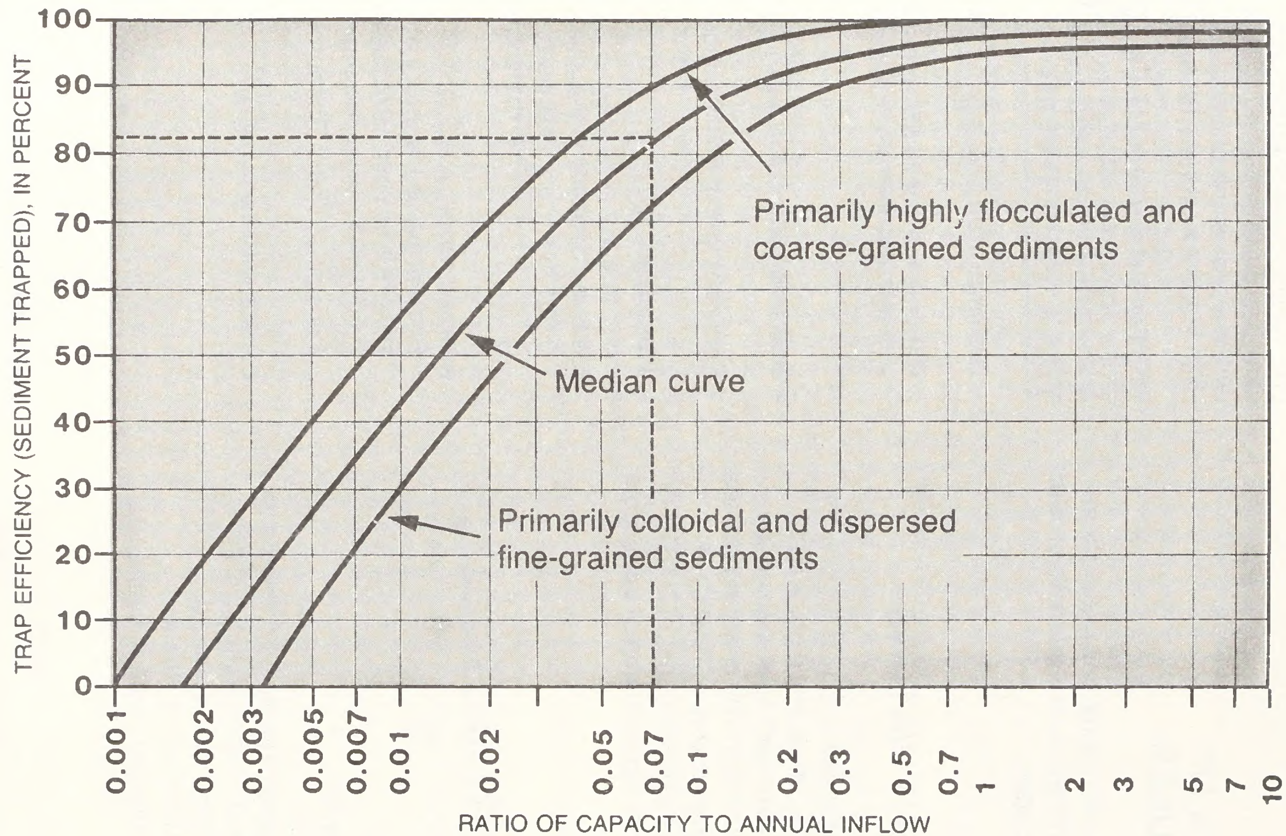

FIGURE A 3-1 TRAP EFFICIENCY OF RESERVOIRS

Source: USDA, SCS National Energy Handbook, Technical Release #12, 1975.

APPENDIX A-6
SOCIOECONOMICS

AREA OF INFLUENCE

The area of influence for socioeconomics includes Carbon and Emery counties in Utah. This area was determined by comparing population levels under the baseline condition with population impacts expected for the proposed actions. Only those Census County Divisions (CCDs) and communities that had a projected 5 percent or greater increase in population over the baseline in the year 2005 (the date when the largest population growth would occur for the proposed actions and the alternatives) are included in the detailed analysis. The following places did not meet that criterion:

Carbon County: Unincorporated areas of East Carbon CCD
Hiawatha
Scofield

Emery County: Emery-Ferron CCD

The Uintah and Ouray Indian Reservation is located in the adjacent counties of Duchesne, Grand, and Uintah. Because of natural barriers that impede commuting, there are not expected to be any significant impacts to those counties or to the reservation, and they are not included in the detailed analysis.

ADJUSTMENTS METHODOLOGY

Changes in the plans of one of the applicants (Chevron-GNC) made it necessary to adjust the impact estimates presented in the **Socioeconomic Technical Report: Sunnyside Special Tar Sand Area Development Analysis** (Argonne National Laboratory 1983). The same adjustments method was used to estimate impacts in the peak construction year of 1989, since those estimates were omitted from the technical report requirements.

There were two changes in the assumptions for the Chevron project. The first was a change from a single project (on lands both inside and outside the Sunnyside Special Tar Sand Area (STSA) and included among the interrelated projects) to 2 separate projects (1 in the STSA and included among the applicants, and 1 outside the STSA and included with the interrelated projects). Work force levels and time schedules were also changed.

This change in the assumption is different for different alternatives. Under both the partial conversion and/or lease stipulations alternative (referred to as partial conversion alternative) and unitized development alternative, Chevron's (in-STSA) project is included among the surface mines feeding a single processing plant. Since the scale of the plant is assumed, the resulting scale of the collective mining operations is also assumed. Therefore, no adjustment is made. The change in Chevron's interrelated (outside-STSA) project applies to both the proposed actions and partial conversion alternative, but not to the unitized development alternative.

The second change (under the unitized development alternative) is to assume that the ore from Chevron's interrelated mine would also go to the single processing plant, and that Chevron would not operate its own plant. Therefore, Chevron's work force is subtracted from the interrelated projects in that alternative.

To clarify the complexity, this will tell whether the old (technical report) or new (adjusted) figures are used in each situation.

	Applicants	Interrelated
Proposed Actions	New	New
Partial Conversion	Old	New
Unitized Development	Old	New, less Chevron

These changes occurred too late to be incorporated into the technical report analysis. It was not possible to run them on the Utah Process Economic and Demographic (UPED) model. The adjustments had to be made in a short time by means of ratios derived from the projections in the technical report. Therefore, the adjusted figures represent far less depth of analysis than the estimates in the technical report.

The adjustment method derives ratios between primary and secondary employment and between

total employment and population separately for construction and operation. This is made possible by the fact that in 1985 and 2005 all of the primary employment is in one of the sectors. The procedure has 4 steps for each set of ratios (this description is for the secondary employment/primary employment ratios):

1. Calculate the construction ratio for 1985 and the operation ratio for 2005.

2. Use those ratios to estimate construction-related and operation-related total employment in 1990 to 2000.

3. Force the estimates in step 2 to equal actual total employment in 1990 to 2000.

4. Divide the construction-related and operation-related total employment derived in step 3 by the respective primary employment figures to obtain ratios for 1990 to 2000.

Algebraically, it goes as follows:

		1985	1990	1995	2000	2005
Primary employment:	construction	A	B	C	D	-
	operation	-	E	F	G	H
Total employment		I	J	K	L	M

Step 1:	I/A = a	M/H = h	
Step 2:	a x B = B'	h x E = E'	
	a x C = C'	h x F = F'	
	a x D = D'	h x G = G'	
Step 3:	J/(B' + E') = j	K/(C' + F') = k	L/(D' + G') = 1
	j x B' = B"	k x C' = C"	l x D' = D"
	j x E' = E"	k x F' = F"	l x G' = G"
Step 4:	B"/B = b	C"/C = c	D"/D = d
	E"/E = e	F"/F = f	G"/G = g

Population/total employment ratios are derived in the same manner, using the forced estimates of construction-related and operation-related total employment from step 3 (items B" - G") for 1990 to 2000 (items B-G). Households and personal income ratios were also derived in the same manner (using primary employment x average annual wage = total primary personal income by sector).

Ratios for the proposed actions and the interrelated projects are used to make the adjustments. Ratios calculated for the partial conversion and unitized development alternatives proved to be either similar to the proposed actions or at variance due to very small numbers. The ratios are applied to the difference between the old and new Chevron work force figures to estimate the effects of those changes. In the unitized development alternative, the ratios are applied to the new Chevron work force figures and those results subtracted from the total figures for the interrelated projects in the other alternatives.

Allocation ratios to the communities are derived from the technical report figures for each analysis year. Allocations for population and households proved to be similar, so the population allocations are used for both. One change that is made from the technical report procedure is to allocate to the counties first, using employment allocation ratios, and then to sub-allocate to the communities in each county.

Estimates for the peak construction year of 1989 are made using the work force figures for that year and the 1990 ratios. Baseline estimates are obtained by interpolation between 1985 and 1990. Although work force requirements also peak in 2003, population impacts do not probably because of growth in secondary employment. Therefore, estimates for 2003 are omitted.

Adjustments to the community services and facilities impacts use the adjusted population figures and standards derived from the infrastructure service demands tables (Tables 4.20 and 4.21) in the technical report. For each service and facility, the collective and cumulative adjusted population impact times the standard gives the demand, which is then compared percentagewise to the respective baseline demand given in the technical report. Baseline estimates for 1989 were obtained by interpolation between 1985 and 1990.

APPENDIX A-7

RECLAMATION AND EROSION CONTROL PROGRAMS

Achieving successful land restoration, reclamation, and erosion control on lands disturbed by project development and operation in the Sunnyside Special Tar Sand Area (STSA) would require an intensive reclamation program. As part of the overall impact evaluation for the projects, site-specific environmental constraints have been compared to the reclamation plans proposed by each of the applicants and agency land use objectives. Environmental constraints were determined from site-specific soil surveys, vegetation surveys, literature reviews, and interviews with agency specialists. Land use objectives were determined based on existing practices and plans expressed by agency personnel and the Unit Resource Analysis (BLM 1980b).

Important inherent environmental variables that influence reclamation success in the region include: (1) climatic conditions (Map 3-2, map pocket); (2) soil properties, such as shallow depths, thin surface layers, low inherent fertility, and large volumes of rock fragments; (3) steep to very steep sloping terrain; and (4) the variation in vegetation types. Other variables dependent on land use and management that would influence reclamation success include livestock grazing control on restored and seeded areas and off-road vehicle (ORV) traffic control on access roads to minimize off-road land surface disturbance.

The lack of successful reclamation in the past has been due, in part, to inadequate reclamation practices and/or a lack of compliance to applicable reclamation practices and continuing follow-up measures. Reclamation efforts have been improving in recent years due to: (1) stronger emphasis on achieving successful reclamation to meet regulatory requirements and a more dedicated stewardship commitment; (2) improved methods, procedures, and plant varieties; (3) improved kinds of machinery to implement practices; and (4) stronger emphasis on compliance and monitoring programs.

TYPES OF LAND DISTURBANCE

Different kinds of land disturbance caused by project activities would require tailored reclamation programs. These programs include: (1) reclamation and revegetation of land disturbed by surface facilities and installation of right- of-way facilities, such as pipelines, roads, and electric transmission lines; (2) reclamation and revegetation of spent sand disposal areas; (3) land restoration, reclamation, and revegetation of surface mined areas; and land disturbance caused by in-situ retorting processes; and (4) protection and reclamation of right-of-way areas subject to periodic construction disturbance due to common corridor use.

ASSUMPTIONS

The determination made concerning erosion control and expected reclamation success on lands disturbed by project construction and operation activities are based on the following assumptions:

(1) Applicants would comply with the proposed erosion control and reclamation programs they have developed and/or would follow through on their commitment to "comply with appropriate regulations and required plans and stipulations to protect and restore the land disturbed by project construction and operation to a stable, productive and aesthetically acceptable condition." The applicants' proposed erosion control and reclamation programs have been reviewed, evaluated, and a determination made as to their adequacy and effectiveness, and additional mitigation identified if necessary (refer to Review and Evaluation of Applicants' Proposed Programs section of this appendix).

(2) Applicants operating on Utah state land would prepare and follow appropriate plans, including applicable measures and procedures to accomplish and ensure successful reclamation of state land affected by project construction and operation, as required by the Utah State Department of Natural Resources, Division of Oil, Gas, and Mining (State of Utah 1982).

(3) Applicants would comply with soil protection and land use goals identified by the landowner on private lands.

(4) Results of the third order soil survey and special studies accurately assess local conditions and potential for reclamation success. Some applicants have conducted detailed soil and vegetation inventories to provide for additional resource inventory data, to identify revegetation and reclamation potential, to determine applicable reclamation measures and their effectiveness, and to identify source areas for favorable soil materials.

(5) The following "Erosion Control, Revegetation, and Restoration Guidelines for use on Federal Lands" would be included as stipulations in the right-of-way grants and mineral leases issued to the applicants by the Bureau of Land Management (BLM) and Forest Service (FS) , and would also be implemented for all other lands including state lands, Indian-owned and controlled lands, and private lands, as agreed on by the applicants and landowner.

For additional assumptions, refer to the Surface Mining and Land Restoration Scenarios, Soil Reconstruction Potential, and Revegetation Potential Sections of this appendix.

EROSION CONTROL, REVEGETATION, AND RESTORATION GUIDELINES FOR USE ON FEDERAL LANDS

The following guidelines would be included as stipulations in the right-of-way grants and mineral leases issued to the applicants.

Standard procedures for the applicants would include implementation of erosion control and revegetation measures to assure that lands disturbed by construction and operation activities would be restored to a stable, productive, and aesthetically acceptable condition.

A detailed, site-specific reclamation plan would be developed and become part of the Construction, Operation, and Maintenance Plan. Because the proposed rights-of-way and project component sites are composed of many types of terrain, soils, vegetation, land uses, and climatic conditions, the detailed plan would include sets of techniques and measures tailored to each condition encountered. Local expertise and locally effective reclamation methods would be followed when the site-specific procedures for the detailed reclamation plan are developed. The erosion control, revegetation, and restoration guidelines and COM Plan would be implemented under the direction of the appropriate agency official.

Detailed information regarding applicable techniques and technical assistance to private landowners concerning erosion control measures and reclamation procedures would be obtained from the Soil Conservation Service (SCS) through local Soil Conservation Districts. Technical assistance and approval of written plans for federal lands would be obtained from the BLM prior to any construction.

During construction of the applicants' projects, an on-site reclamation specialist would be employed by the applicants to provide: (1) liaison with private landowners, federal agency officials, and local governments; (2) expertise to direct applicable restoration procedures when special conditions are encountered, without causing construction delays; and (3) favorable public relations.

General erosion control and restoration measures have been developed for the following areas and will be included as part of the COM Plan:

- Right-of-Way and Site Clearing
- Trenching, Surface Mining, Preservation of Topsoil (Favorable Plant Growth Material), and Overburden Handling
- Backfilling and Grading
- Land Preparation for Seeding and Cultivation
- Revegetation (Reseeding and Planting)
- Maintenance and Monitoring
- Use of Biochemicals
- Construction Timing

RIGHT-OF-WAY AND SITE CLEARING

Emphasis would be placed on protecting existing vegetation and minimizing disturbance of the existing environment by implementing the following measures:

- Land grading would be done only on the area required for construction.

- Sidehill cuts for right-of-way facilities would be kept to a minimum to ensure resource protection and a safe and stable plane for efficient equipment use. The authorizing agency would provide assistance and would approve sidehill cuts prior to construction.

- Existing ground cover such as grasses, leaves, roots, brush, and tree trimmings would be cleared and piled only to the extent necessary. Slash would be piled and later shredded and chipped for use in restoration operations or disposed of at the discretion of the authorized agency.

- Trees and shrubs on the right-of-way and surface mine areas that are not cleared would be protected from damage during construction, operation, and maintenance.

- Where the right-of-way crosses streams and other water bodies, the banks would be stabilized to prevent erosion. Construction techniques would minimize damage to shorelines, recreational areas, and fish and wildlife habitat.

- Care would be taken to avoid oil spills and other types of pollution in all areas, including streams and other water bodies, and in their immediate drainage areas. All spills would be immediately cleaned up.

- Design and construction of all temporary roads would be based on an approved transportation plan and would ensure proper drainage, minimize soil erosion, and preserve topsoil. After abandonment, these roads would be closed and areas restored without undue delay or maintained at the discretion of the landowner. Restoration, including redistribution of topsoil, would be to the satisfaction of the landowner and/or authorizing agency.

- During adverse weather conditions, as determined by the on-site reclamation specialist, the authorizing agency would issue stop and start orders to prevent rutting or excessive tracking of soil and deterioration of vegetation in the right-of-way area.

- During construction activities, surface mining activities, and spent sand disposal area reclamation near streams or lakes; sedimentation (detention) basins and/or straw bale filters would be constructed to prevent suspended sediments from reaching downstream watercourses or lakes, as required by the authorizing agency.

- Actual construction activities would immediately follow clearing operations, especially in areas of soils that are highly susceptible to wind or water erosion and other special areas.

TRENCHING, SURFACE MINING, PRESERVATION OF TOPSOIL (FAVORABLE PLANT GROWTH MATERIAL), AND OVERBURDEN HANDLING

Trenching, surface mining, and overburden handling methods and techniques would ensure that:

- On right-of-way facilities, mining areas, and spent sand disposal areas, topsoil and favorable plant growth material would be removed from the area (i.e., stored separately, protected, and replaced last during backfilling). This procedure would be followed as specified by the authorizing agency.

- Remaining unearthed materials would be removed and stored in a manner that facilitates backfilling procedures, uses a minimum amount of area, and protects the excavated material from vehicular and equipment traffic and erosion.

- Cofferdams or other diversionary techniques would be used, where necessary, to permit flow in one part of a stream while pipelaying construction occurs in another part.

- A specific excavated material stockpile procedure would be used on steep-sloping and rough, broken terrain to ensure minimum

disturbance as developed by both the authorizing agency and applicant.

BACKFILLING AND GRADING

The following backfilling and grading techniques would be used:

- Backfill would be replaced in a sequence and density similar to the preconstruction soil condition (pipelines).
- Backfilling operations would be conducted in a manner that would minimize further disturbance of vegetation.
- The contour of the ground would be restored to permit favorable surface drainage.
- In strongly sloping and steep terrain, erosion control structures such as water bars, diversion channels, and terraces would be constructed to divert water away from the pipeline trench and reduce soil erosion along the right-of-way and other adjoining areas disturbed during construction.
- All structures such as terraces, levees, underground drainage systems, irrigation pipelines, and canals would be restored to preconstruction conditions so that they would function as originally intended.
- Surface mined areas and spent sand disposal areas would be graded and shaped to allow for adequate slope stability, soil erosion control, and establishment of vegetative cover.
- The surface would be graded to conform to the existing surface of the adjoining areas except for a slight crown over the trench to compensate for natural subsidence. In cropland areas, especially border and furrow irrigated cropland, the soils would be compacted and the crown would be smoothed to match the bordering area to allow surface irrigation (pipelines).
- Topsoil would be uniformly replaced over the trench fill and other disturbed areas to restore productivity to the preconstruction condition.
- Materials unsuitable for backfilling or excess backfill material would be disposed of as arranged by the authorizing agency.
- Temporary work space areas used at stream and highway crossings and other special sites would be restored to approximate preconstruction conditions and to the satisfaction of the authorizing agency.
- The right-of-way at stream crossings would be restored to a preconstruction state. The upland area and banks would be revegetated to preconstruction conditions. Where this is not possible, they would be mulched with rock. The size of the rock mulch would be larger in diameter than materials excavated from the trench. The streambed would be returned to its original contours with sediments like those that were excavated.

LAND PREPARATION FOR SEEDING AND CULTIVATION

Construction, backfilling, and grading activities commonly cause compaction and alter soil conditions that affect soil productivity and/or seeding success in the construction and mining area. The following practices and techniques would be used to improve these soil conditions, protect soil from erosion, and provide a favorable seedbed:

- In cropland areas, as required by the authorizing agency or landowner, subsoiling or chiseling would be used to ensure that soil compaction is reduced and preconstruction soil permeability is restored.
- Chiseling would be used, unless objected to by the landowner or authorizing agency, in range land areas to reduce compaction and improve soil permeability. Pitting and contour furrowing as directed by the authorizing agency or landowner would be done on steeper slopes of disturbed areas to increase infiltration and to reduce runoff and erosion.

- Suitable mulches and other soil stabilizing practices would be used on all regraded and topsoiled areas to protect unvegetated soil from wind and water erosion and to improve water absorption.

- Special mulching practices or matting would be necessary in critical areas where wind and water are serious erosion hazards, in order to protect seeding, seedlings after germination, and plantings.

- Commercial fertilizers would be applied to soil areas with low inherent fertility to maintain crop yields and establish grass seedings. Application rates would be commensurate with annual precipitation and available irrigation water.

- Seedbeds for areas seeded to grass would be prepared to provide a firm and friable condition suitable for the establishment of grass stands.

- Rock mulches would be used in steep-sloping rock outcrop areas and low precipitation areas to reduce erosion and promote vegetal growth.

- Cultivation and land preparation operations on steeply sloping areas would be done on the contour to minimize erosion.

- Soil areas with rock fragments, such as very coarse gravel, cobble, or stone scattered on the surface, would be restored to the original preconstruction surface condition to blend with the adjoining area, to avoid a smooth surface area, and to control accelerated erosion.

REVEGETATION (RESEEDING AND PLANTING)

The loss of vegetation from lands disturbed by pipeline construction, surface mining, in-situ mining, and spent sand disposal can be mitigated only by satisfactory revegetation. To ensure a successful revegetation program, methods and procedures would be consistent with local climate and soil conditions and would follow recommendations and directions of local experts. Revegetation efforts would be continued until a satisfactory vegetative cover is established. The following practices and techniques would be used in areas where reseeding is suitable as determined by the authorizing agency:

- A firm seedbed would be prepared prior to seeding. This would include a mulch of plant residues or other suitable materials. A cover crop may be needed in larger disturbed areas.

- Seed would be planted by drilling, broadcasting, or hydroseeding. Drilling is the preferred method, because it is usually the most successful. Drill seeding with a grass drill equipped with depth bands would be used where topography and soil conditions allow operation of equipment to meet the seeding requirements of the species being planted. Broadcast seeding would be used for inaccessible or small areas. Seed would be covered by raking or harrowing. Hydroseeding would be done in critical areas determined by the reclamation specialist or authorizing agency.

- Only species adaptable to local soil and climatic conditions would be used. Generally, these would be native species. However, introduced species may be considered for specific conditions when approved by the landowner and authorizing agency. Seeding rates in critical area plantings and generally throughout the right-of-way would be increased 100 percent over regular seeding rates to allow for seed mortality due to adverse growing seasons.

- Seed testing would be conducted to meet state, federal, and authorizing agency seed requirements.

- Seeding would be done when seasonal or weather conditions are most favorable, and as determined by the landowner or authorizing agency.

- Grazing or mowing would be delayed at least one season after seeding to provide time for vegetation to become established, especially in highly erodible areas, unless objected to by the landowner or authorizing agency.

Protective fencing may be necessary in special areas and would be constructed, maintained, and removed according to authorizing agency specifications.

- In areas of low annual precipitation (generally less than 8 to 10 inches) where reseeding is not suitable or as successful, erosion control structures and measures would be applied on sloping areas to reduce accelerated erosion, to allow reestablishment of preconstruction surface soil conditions, and to allow natural revegetation.
- Trees and shrubs would be reestablished in areas as specified in the revegetation plan.

MAINTENANCE AND MONITORING

Joint inspection of the reclaimed areas by the applicant and authorizing agency would be conducted to monitor the success and maintenance of erosion control measures and revegetation programs on native grazing land for two growing seasons, or for a period determined by the landowner on private land, or the authorizing agency on state or federal land. The monitoring program would identify problem program areas and corrective measures to ensure cover and erosion control. Certification of successful revegetation and erosion control would be determined by the landowner or authorizing agency.

USE OF BIOCHEMICALS

The use of biochemicals such as herbicides, fungicides, and fertilizers would comply with state and federal laws, regulations, and policies regarding the use of poisonous, hazardous, or persistent substances. State and federal wildlife agencies would be contacted if application of any of these substances would be on or near sensitive wildlife areas. Application of these substances would be by ground methods. Prior to the use of such substances on or near the permit or grant area, the applicant would obtain approval of a written plan for such use from the authorizing agency, landowner, and appropriate wildlife agency. The plan would outline the kind of chemical, method of application, purpose of application, and other information as required, and would be considered as the authorized procedures for all applications until revoked by the authorizing agency, landowner, or appropriate wildlife agency. This plan would become part of the COM Plan.

CONSTRUCTION TIMING

Pipeline construction activities on irrigated cropland would be timed, as possible, to avoid disruption of irrigation delivery systems during the major irrigation season, to reduce effects on crop production in areas of construction as well as adjoining irrigated cropland areas served by the systems.

REVIEW AND EVALUATION OF APPLICANTS' PROPOSED PROGRAMS

The applicants' erosion control, reclamation, and revegetation programs were reviewed using information collected for the vegetation, soils, agriculture, and climate studies done for the projects. The reclamation procedures were evaluated in separate phases according to the type of land disturbance based on the potential problem areas and conditions identified in the vegetation, soils, and climatic inventories. The measures and procedures outlined by the applicants were then evaluated for completeness and to determine whether they were applicable and effective for the range of soils, vegetation types, terrain, land use, and climatic conditions encountered in the project area.

Table A-7-1 is the checklist that was used as a guideline for the review and evaluation of the erosion control, reclamation, and revegetation programs. The checklist is a summarized list of effective and reliable measures and procedures essential for successful erosion control and reclamation. (The sources for these measures and procedures are identified on the table.) A summary of review comments for each applicant's proposed erosion control and reclamation program is presented in the following individual project discussions:

AMOCO

The erosion control and reclamation program outlined by Amoco in their proposed plan of operations and Erosion Control, Restoration, and Reclamation Program supplements (Amoco 1983) identifies the intent to follow the Erosion Control and Reclamation Guidelines and to restore all disturbance on federal, state, and private land. Even though no specific plan was addressed, the program outlined by Amoco identifies applicable measures and procedures that would be implemented to restore, reclaim, and revegetate land disturbance associated with surface mining activities (refer to Table A-7-1).

The major concern regarding Amoco's restoration and reclamation program is that reclamation of the open pit would not start until the 20th year, when the unreclaimed area would be approximately 3,000 acres. This creates a problem of topsoil (favorable plant growth material) and overburden storage, handling, and replacement. This also allows a larger area to be susceptible to accelerated erosion and remain vegetatively unproductive. The magnitude of these impacts are analyzed and identified in Chapter 3. Mining and restoration should be designed to limit the unreclaimed area to less than 25 percent of the lease area and provide for a reclamation program more concurrent with mining activity.

CHEVRON-GNC

The erosion control and reclamation program outlined in Chevron's proposed plan of operations (Chevron 1982) is very general and incomplete (refer to Table A-7-1). Chevron's general statement indicates the intent to protect and reclaim land disturbance caused by project activities. They have indicated a reclamation research program would be developed during the mining operation to investigate effective plant species selection and reclamation techniques. Actually this should be a reclamation effectiveness monitoring program. The objective should be the development of an effective erosion control and reclamation plan based on the research and experiences available.

Chevron-GNC has proposed seed mixtures that contain mainly introduced plant species. Adapted native species would be generally required, and introduced species would be considered for specific conditions when approved by the landowner and authorizing agency.

It is assumed that an adequate reclamation program would be implemented because of the intent identified, compliance with site-specific erosion control and reclamation plans approved by authorizing agencies, and compliance with the accompanying requirements and stipulations that are a part of the right-of-way grants and mineral leases for federal and state lands.

ENERCOR

The erosion control and reclamation program outlined in Enercor's proposed plan of operations (Enercor 1982) identifies the intent to follow the erosion control and reclamation guidelines and to restore all land disturbance caused by project activities. Enercor's program addresses most of the measures specified in the checklist (Table A-7-1). Enercor's general provisions meet the objectives and intent of ensuring successful reclamation.

MONO

The erosion control and reclamation program presented in Mono's proposed plan of operations (Mono 1982) is thorough and very adequate. Mono's program addresses the essential general procedures and the applicable measures specified in the checklist (Table A-7-1).

Mono has indicated native plant species would generally be seeded. Introduced species would be considered for specific conditions when approved by the landowner and authorizing agency.

Compliance with the reclamation program as outlined provides the necessary measures to ensure successful erosion control and reclamation of land disturbance.

SABINE

The erosion control and reclamation program outlined by Sabine in their proposed plan of

operations (Sabine 1982) is very general (refer to Table A-7-1).

Even though there would be less land surface disturbance (no major soil and overburden alteration and no spent sand disposal reclamation), timely implementation of effective erosion control and reclamation measures would be necessary to ensure successful erosion control and revegetation of the land disturbance associated with the in-situ mining process.

The strongly sloping and steep terrain would necessitate intensive implementation of erosion control and reclamation measures to protect and revegetate land disturbance associated with drill sites, pipelines, powerlines and access roads.

It is assumed that an adequate reclamation program would be implemented, because of the intent identified and because of the necessary compliance with site-specific erosion control and reclamation plans approved by authorizing agencies, and compliance with the accompanying requirements and stipulations that are a part of the right-of-way grants and mineral leases for federal and state lands.

TABLE A-7-1
EROSION CONTROL, RECLAMATION, AND REVEGETATION PROGRAM CHECKLIST[a]

RECLAMATION METHODS AND PROCEDURES[b]	REVIEW COMMENTS REGARDING APPLICANT'S PROGRAM[c] Amoco	Chevron-GNC	Enercor	Mono	Sabine
GENERAL MEASURES					
A. Avoidance of Critical Areas by Preplanning Construction Alignment (where possible).	O	O	O	O	O
B. Construction Timing to Minimize Impacts (e.g., cropland areas).	NA	NA	NA	NA	NA
C. Construction Precautions During Adverse Weather Conditions (e.g., prevent tracking and compaction during wet soil conditions).	X	O	X	X	O
D. Minimize Off-road Vehicle Travel to Reduce Land Surface Disturbance.	X	O	X	X	O[c]
E. Preparation and Implementation of an Erosion Control, Reclamation, and Revegetation Plan Tailored to Conditions, Within Project Area.	X	O	X	X	O
F. Reclamation Accomplished in all Disturbed Areas as soon as Practical.	O	X	X	X	X
*G. Compliance with Regulations (local, state, and federal) and Implementation of Applicable Measures and Procedures.	X	X	X	X	X
LAND SURFACE AREA DISTURBANCE, EROSION CONTROL, AND RECLAMATION					
A. Right-of-Way and Site Clearing and Preparation					
1. Minimize area disturbance	X	X	X	X	X
2. Vegetation and growth cover clearing, storage, or disposal	X	X	X	X	X
3. Protection of existing vegetation	X	X	X	X	X
4. Protection of natural drainage	X	O	X	X	O
5. Land grading technique-steep slopes	O	O	O	X	O
6. Techniques used at stream crossings and streams	X	O	X	X	O
7. Erosion control (wind and water) measures	X	X	X	X	X
8. Sedimentation (retention) basins, dikes, and diversions	X	X	X	X	X
9. Design, construction, and restoration of temporary roads and construction sites	O	O	O	X	O
B. Site Grading, Trenching, and Preservation of Topsoil and Excavated Material Handling					
1. Topsoil (or suitable plant growth material) removal, storage, and protection	X	X	X	X	X
2. Excavated material stockpiling procedures	X	O	O	X	O
3. Trenching techniques (steep sloping areas)	X	O	O	X	O
4. Grading techniques for surface facilities	O	O	O	X	O
5. Fill areas (compaction and erosion control)	O	O	O	X	O
C. Backfilling, Shaping, and Cleanup					
1. Backfilling procedures (compaction)	X	X	X	X	X
2. Topsoil replacement	X	X	X	X	X
3. Restoring contour of land surface to permit drainage	X	O	X	X	O
4. Restoring soil physical conditions (subsoiling, etc.)	X	O	X	X	O
5. Restoring structures (roads, irrigation systems, etc.)	O	O	O	X	0
6. Match surrounding landscape (rock outcroppings, coarse fragments on surface, etc.)	X	O	X	X	O
7. Erosion control measures (contouring, terraces, diversions)	X	X	X	X	X
8. Excess or unsuitable excavated material disposal	O	O	O	O	O
D. Land Preparation for Seeding and Cultivation					
1. Measures to improve soil physical conditions	X	O	X	X	O
2. Seed bed preparation	X	O	X	X	O
3. Surface roughness condition	X	O	O	X	O
4. Fertilizers and other soil admendments (if applicable)	X	O	O	X	O
5. Suitable mulches and mulching practices	X	O	X	X	X
6. Land preparation methods on "critical areas"	O	O	O	O	O

TABLE A-7-1 (Continued)
EROSION CONTROL, RECLAMATION, AND REVEGETATION PROGRAM CHECKLIST[a]

RECLAMATION METHODS AND PROCEDURES[b]	REVIEW COMMENTS REGARDING APPLICANT'S PROGRAM[c] Amoco	GNC	Chevron-Enercor	Mono	Sabine
E. Revegetation (Reseeding and Planting)					
1. Selection of adapted species	X	X	X	X	X
2. Seeding and planting methods and techniques	X	O	O	X	O
3. Supplemental irrigation (when applicable)	NA	NA	NA	NA	NA
4. Protection of seedlings	X	O	O	X	O
5. Continuing revegetation efforts to ensure satisfactory cover (when necessary)	O	O	O	X	O
F. Maintenance and Monitoring					
1. Identify maintenance, monitoring, and corrective measures to ensure erosion control and successful revegetation	O	O	X	X	O
G. Use of Biochemicals					
1. Identify procedures regarding use of herbicides, pesticides, and fertilizers (when needed)	O	O	O	X	O
PROCESSED TAR SAND DISPOSAL AREA RECLAMATION					
A. Topsoil and Suitable Plant Growth Material Removal and Storage	X	X	X	X	NA
B. Design of Disposal Area (geomorphic relationships, blending with surrounding terrain)	X	O	O	X	NA
C. Ground Water Contamination Control	O	O	O	O	NA
D. Suitable Surface Water Runoff Control Structures, and Retention Ponds (surface water contamination control)	X	O	X	X	NA
E. Placement and Compaction of Spent Sand	O	O	O	O	NA
F. Shaping and Contouring Disposal Embankments	X	O	X	X	NA
G. Leaching Soluble Salts from Root Zone	O	O	O	O	NA
H. Topsoil or Suitable Plant Growth Material Replacement (blending color of disposal pile with surrounding area)	X	O	X	X	NA
I. Application of Organic Matter, Fertilizers, and Soil Admendments	X	O	X	X	NA
J. Erosion Control Measures (contouring, diversions, benching, etc.)	X	X	X	X	NA
K. Seeded Preparation	X	X	X	X	NA
L. Suitable Mulches and Mulching Practices	X	X	X	X	NA
M. Selection of Adapted Species for Revegetation	X	O	X	X	NA
N. Applicable Seeding and Planting Methods	X	O	X	X	NA
O. Transplanting Native Shrubs and Trees to Blend Visually with Surrounding Area (if applicable)	NA	NA	NA	NA	NA
P. Supplemental Irrigation (if applicable)	O	O	O	O	NA
Q. Protection of New Seedlings and Plantings from Livestock and Wildlife	X	O	X	X	NA
R. Continuing Revegetation Efforts (where necessary)	X	O	O	X	NA
S. Maintenance, Monitoring, and Corrective Measures	X	O	O	X	NA
T. Use of Surface Water Runoff for Revegetation and Other Project Use	O	O	O	X	NA
SURFACE MINING AND IN-SITU MINING RECLAMATION					
A. Surface Mining Sequence and Design (compatible with terrain and overburden)	X	X	X	X	X
B. Overburden Analysis (physical and chemical)	O	O	O	O	NA
C. Topsoil and/or Suitable Plant Growth Material Removal and Storage	X	X	X	X	X
D. Materials Handling (soils and overburden)	X	O	X	X	NA
E. Ground Water Contamination Control Measures	O	O	O	O	O

TABLE A-7-1 (Concluded)
EROSION CONTROL, RECLAMATION, AND REVEGETATION PROGRAM CHECKLIST[a]

RECLAMATION METHODS AND PROCEDURES[b]	REVIEW COMMENTS REGARDING APPLICANT'S PROGRAM[c] Amoco	Chevron-GNC	Enercor	Mono	Sabine
F. Suitable Surface Water Runoff Control Structures and Retention Ponds (surface water contamination control)	X	X	X	X	X
G. Covering Undesirable Spoil Material	O	O	O	X	NA
H. Placement and Compaction of Spoil Material	X	O	X	X	NA
I. Grading, Shaping, and Restoration of Natural Surface Drainages	X	O	O	X	O
J. Topsoil and/or Suitable Plant Growth Material Replacement on Mine Overburden	X	O	X	X	NA
K. Erosion Control Measures (contouring, diversion, benching, etc.)	X	X	X	X	X
L. Application of Organic Matter, Soil Admendments and Fertilizers.	O	O	O	X	O
M. Maintaining Soil Physical Conditions (subsoiling, etc.)	O	O	O	X	O
N. Seed Bed Preparation	X	X	X	X	O
O. Suitable Mulches and Mulching Practices	X	O	X	X	O
P. Selection of Adapted Species for Revegetation	X	X	X	X	X
Q. Applicable Seeding and Planting Methods	X	O	X	X	O
R. Transplanting Native Shrubs (Nursery Stock) to Blend Visually with Surrounding Areas (if applicable)	NA	NA	NA	NA	NA
S. Supplemental Irrigation (if applicable)	NA	NA	NA	NA	NA
T. Protection of New Seedlings and Plantings from Livestock and Wildlife	O	O	O	X	O
U. Maintenance, Monitoring, and Corrective Measures (including revegetation efforts, where necessary)	X	X	X	X	O
V. Use of Surface Water Runoff for Revegetation	O	O	O	O	O

[a]This checklist was developed by the Bureau of Land Management, Division of EIS Services to provide a guideline to review and evaluate the adequacy and effectiveness of the applicants' proposed erosion control, reclamation, and revegetation programs. The checklist consists of a summarized list of measures, practices, and procedures essential to ensure successful reclamation, revegetation, and erosion control for land disturbance.

[b]The measures and procedures listed have been used in meeting objectives associated with soil and water conservation, water management, pollution abatement, waste disposal, improved fish and wildlife habitat and improved quality of the environment. The effectiveness and reliability of these measures and procedures are based on research, field trials, and experiences of many years. Specific measures associated with surface mining activities and processed sand disposal areas are based on recent research and field trials. All practices and procedures identified are well-documented and have been demonstrated to be reliable in making assumptions regarding effectiveness when properly implemented. (List of references (30) available upon request from Bureau of Land Management, EISS, 555 Zang Street, First Floor East, Denver, Colorado 80228.)

[c]Review comments should reflect the adequacy of the applicant's proposed program by: (1) identifying the essential measures and procedures recognized; (2) identifying essential measures omitted; (3) making note of overall intent and compliance to ensure successful reclamation, revegetation, and erosion control; and (4) establishing whether program is tailored to the needs and conditions (soils, vegetation, and climate) of the project area. Additional mitigation measures needed by applicant should also be identified.

X = Measure(s) contained in applicant's proposed program.
O = Measure(s) not contained in applicant's proposed program.
NA = Measure(s) determined to be not applicable or not essential.

SOILS

A third-order soil survey (SCS and BLM 1981) that covers the entire Sunnyside STSA is available. Soil information from this soil survey was used to evaluate potential impacts and would be used by the applicants and authorizing agencies to determine applicable erosion control, reclamation, and revegetation measures.

The area of influence includes a wide variety and complex combinations of soils due to variations in parent material (geologic), climatic, topographic, and vegetative features. The soil map units from the third-order soil survey were combined into the following generalized groups to describe the soils within the area of influence, to evaluate potential impacts, and to determine effective erosion control measures, reclamation, and revegetation potential of the area.

SOILS OF THE FLOODPLAINS AND TERRACES (A)

This group consists of deep, well-drained to moderately well-drained, mildly alkaline to slightly acid, loamy, and sandy soils containing varying amounts of rock fragments ranging from 5 to 60 percent, including areas with bouldering surfaces. These soils are on gently sloping to moderately sloping (1 to 8 percent) floodplains within the narrow, elongated, intermittent and perennial drainages, including the smoother sloping toe slopes of the adjoining mountain sideslopes. These soils are formed in a mixed alluvium derived mainly from sedimentary rock (sandstone and shale). They are subject to a slight to moderate water erosion hazard, flooding, and stream cutting. These are some of the most productive soils of the area and are used for grazing and wildlife and, because of the smoother slopes, they are used for transportation corridors especially in theual precipitation ranging from 12 to 20 inches and are most dominant in the 60- to 120-day growing season area. Due to the physiographic position of this soil group in that it receives runoff from the surrounding sloping areas, no subgroup for precipitation was made. Some areas of this soil group are mappable on the 1:24,000 scale; however, many of the narrow, elongated areas adjacent to stream courses are too small to separate. Even though areas are not delineated on maps, because of its importance to watershed conveyance, this soil group must be recognized.

SOILS OF THE SLOPING TO STRONGLY SLOPING ALLUVIAL FANS AND HIGH TERRACES OF THE PLAINS (F)

This group consists of mainly deep, well-drained, loamy, and sandy soils on gently sloping to strongly sloping (3 to 15 percent) alluvial fans, terraces, and benches in the outwash plains area. These soils are forming in mixed materials weathered from sedimentary and metamorphic rocks with varying amounts of rock fragments (15 to 65 percent) ranging in size from gravel to stone, including some boulder, on the surface and scattered throughout the profile. These soils are subject to a moderate water erosion hazard. They are used for livestock grazing and wildlife habitat. They occur in areas with average annual precipitation of 12 to 16 inches and a 60- to 120-day growing season. This group of soils is located in the plains area southwest of the mountain ridges in the vicinity of Sunnyside, Columbia, East Carbon City, and Dragerton. Project components proposed on this area of soils include processing plants, mill sites, and spent sand disposal areas.

SOILS OF THE SLOPING TO STRONGLY SLOPING MESAS, MOUNTAIN RIDGE TOPS, PLATEAUS, AND STRONGLY SLOPING TO MODERATELY STEEP MOUNTAIN SIDE SLOPES (M)

This group consists of shallow and moderately deep to deep, well-drained, slightly alkaline to moderately acid, sandy and loamy soils on sloping to strongly sloping (3 to 15 percent) mesas, convex mountain ridge tops, plateaus, and strongly sloping to moderately steep (9 to 25 percent) mountain sideslopes. These soils are forming in mixed alluvial, colluvial, and residual materials derived mainly from sedimentary rock (sandstone and shale) and contain varying amounts of rock fragments (10 to 65 percent) ranging in size from gravel to stone. These soils are subject to a slight to moderate water

erosion hazard. They are used mainly for livestock grazing and wildlife habitat. This soil group occurs in all the climatic zones. These soils most commonly have moderately high forage production, especially in the 16- to 20- and 20- to 30-inch annual precipitation zones.

This soil group is located in 3 climatic zones:

M-1 12- to 16-inch average annual precipitation and 60- to 120-day growing season.

M-2 16- to 20-inch average annual precipitation and 60- to 120-day average growing season.

M-3 20- to 30-inch average annual precipitation and less than 60-day growing season.

SOILS OF THE STEEP AND VERY STEEP MOUNTAIN SIDESLOPES, CANYON WALLS, AND MESA ESCARPMENTS (MS)

This group consists of dominantly rocky, very shallow, shallow and moderately deep, well-drained, slightly alkaline to moderately acid, sandy-skeletal, and loamy-skeletal soils on steep, very steep, and extremely steep (30 to 75+ percent) mountain sideslopes, canyon walls, and mesa escarpments. Common inclusions are areas of rock outcrop and small areas of deep soils in concave and toe slope areas. These soils are forming in mixed alluvial, colluvial, and residual materials derived from sedimentary rock (sandstone and shale) with varying amounts of rock fragments (35 to 60 percent) and ranging from gravel to stone in size. Surfaces range from stony to extremely bouldering. These soils are most commonly sparsely vegetated, south-facing slopes in the lower precipitation zone and are subject to high runoff and a high erosion hazard. North-facing slopes are commonly vegetated with mixed conifers, aspen, and mountain shrubs and are also subject to a high water erosion hazard. These soils are used mainly for wildlife habitat, wadue to accessability, steep terrain, and low timber value.

This group is located in three climatic zones:

MS1 12- to 16-inch average annual precipitation and 60- to 120-day growing season.

MS2 16- to 20-inch average annual precipitation and 60- to 120-day growing season.

MS3 20- to 30-inch average annual precipitation and less than 60-day growing season.

RECLAMATION AND EROSION CONTROL ANALYSIS

The reclamation and erosion control procedures (Assumptions section of this appendix and Table A-7-1) were developed and evaluated using information collected in the soils and vegetation review of the projects. The methodology used to make the analysis is discussed below.

Soils, vegetation, and climatic information was collected for the surface areas potentially disturbed. The soil survey of the Range Creek portion of the Carbon area, Carbon County, Utah (SCS-BLM 1980) was used to identify soil types and terrain strongly affecting construction and surface mining procedures, and revegetation and restoration potential.

The soils data was analyzed and evaluated to identify the following:

- areas with soil properties that strongly affect restoration and revegetation of native rangeland;
- the reconstruction potential of the soil types affected;
- areas that are susceptible to high wind and water erosion hazards;
- effective measures to minimize the effect of soil disturbances caused by construction activities, surface mining, on-site mining, spent sand disposal, and to control accelerated erosion; and
- areas where erosion and resultant sediment yield affect water quality.

Soil erosion losses were estimated by the use of the universal soil loss equation (USLE) and the wind erosion equation as applied to construction sites for selected soil areas representing various conditions occurring throughout the area of influence.

Recent developments in the soil loss equation make it a valuable tool for selecting and evaluating conservation practices on disturbed areas resulting from construction activities. The information gained by application of the USLE to selected soil sites was used as a basis for determining appropriate erosion control and revegetation measures, and to evaluate the effectiveness of those measures to ensure successful erosion control, revegetation, and restoration.

Selected soils representing significant conditions within the area of influence were evaluated. The soils and conditions presented in Table A-7-2 present some of the conditions that would be expected to occur. This table also identifies the effectiveness of several erosion control measures or combinations that could be implemented to control soil erosion.

Additional information, consisting of major rangeland management concerns and recommended conservation practices, was obtained from the Price River Grazing Management Draft Environmental Impact Statement (BLM 1982) and the Soil Survey of the Carbon-Emery Area, Utah (SCS-BLM 1980).

A detailed site-specific construction and erosion control plan would be developed, including locally recommended techniques and measures tailored to the conditions encountered. Proper implementation of the erosion control and revegetation measures outlined in the guidelines would assure successful restoration of land by construction and operation activities.

The outlined maintenance and monitoring program would identify problem areas caused by adverse weather conditions during restoration periods or small localized areas with adverse soil properties, and provide corrective measures to ensure erosion control.

SURFACE MINING AND LAND RESTORATION SCENARIOS AND SPENT TAR SAND DISPOSAL AREA RECLAMATION

Due to the dominantly steep and very steep terrain and overburden depth; special surface mining, land restoration, and reclamation procedures and measures would be necessary to ensure successful ore extraction and reclamation of the surface mined areas.

Two types of surface mining reclamation scenarios were identified by the applicants in their proposed plans of operations. These two scenarios that were used for evaluating impacts are: (1) surface mining land disturbance would be reclaimed in stages concurrently with mining progress, with only a part of the mining area disturbed and remaining unreclaimed at any one time. After a workable pit opening (approximately 80 to 320 acres) is excavated, overburden would be replaced within the mined area, regraded, seeded, and plants would be allowed to reestablish; and (2) surface mining would continue for a period of 20 years before reclamation procedures would be initiated. This scenario is proposed by Amoco. The unreclaimed area would be approximately 3,000 acres, causing a larger area to be subject to accelerated erosion and remain vegetatively unproductive.

Due to the major topographic changes caused by surface mining activities and the predicted unfavorable plant growth properties and erosive nature of the spent tar sand, special land restoration, reclamation, and erosion control measures would be necessary to ensure successful reclamation. The following measures would be necessary (refer to Table A-7-2 for scenario erosion control analysis).

- The restored land surface slope would not exceed 35 percent, except for areas where headwalls could be maintained. Dominant slope would range from 5 to 30 percent.

- The restored land surfaces, temporary topsoil and overburden storage piles, and the spent sand disposal piles would be benched or contain diversionary structures at slope

intervals not exceeding 100 feet, to reduce runoff velocities and concentrations.

- Adequate amounts of the most favorable plant growth materials would be replaced on the regraded land surface to provide for establishment of vegetative cover.

- Land surfaces of restored areas and soil and overburden areas would be protected by crop residues and rock fragment mulches in combination with contour soil surface manipulations and rip-rapped diversion structure outlets.

- Retention dams and sediment ponds would be used to control sediment.

- Land form restoration would include grading and land surface shaping to blend, as possible, with the surrounding surface mined and unmined topography, to minimize the disequilibrium landscape effect, provide for maintenance of an effective surface drainage system commensurate with the topography and annual precipitation, and to provide for stable slopes (ASA, CSSA, SSSA 1978).

- Applicable conservation measures would be used as outlined in the Erosion Control, Reclamation and Revegetation Guidelines.

SOIL RECONSTRUCTION POTENTIAL

The soils within the area of influence are dominantly classified as Land Capability Unit VII including smaller areas of Land Capability Class VI. This Land Classification System (SCS 1961) is a grouping of soils into special units according to their capability for intensive use and the treatment required for sustained use. Soils in Class VI have severe limitations that make them generally unsuitable for cultivation and limits their use largely to pasture range, woodland, or wildlife food and cover. Sites in Class VII have very severe limitations that make them unsuitable to cultivation and restrict their use largely to grazing, woodland, wildlife or water supply, and aesthetic purposes.

Approximately 78 percent of the soils within the potential mine area are dominantly shallow to moderately deep (10 to 40 inches) to bedrock, contain varying amounts of rock fragments (15 to 50 percent by volume), and occur on steep and very steep terrain. Detail information concerning soil types and extent is available at the BLM, Division of EIS Services.

The surface mining process would completely alter the original soil profile characteristics. Soils would be reconstructed during the land restoration and reshaping process. Concerns related to soil reconstruction in the area include availability of favorable plant growth material and the varying amounts and sizes of rock fragments.

The reconstructed soils on the reclaimed area would have properties that would depend upon the availability of favorable plant growth material from the soil types affected and the process of effectively utilizing these materials in the reshaping and regarding process. It is estimated that the reconstruction soils would consist of deep, unconsolidated, overburden material mantled with a surface layer of original surface soil and favorable plant growth material averaging 12 or more inches thick. Even though this reconstructed soil would have no structure, the texture and rock fragments would allow for favorable water infiltration, permeability and water holding capacity. (Soil-water relationships are expected to be enhanced over the preconstruction condition.) The soil organic matter and nutrient levels could be most strongly affected by the soil reconstruction process. Additions of organic matter in the form of crop residues, manure, and wood fiber would improve the soil organic matter level. Application of commercial fertilizers containing nitrogen and phosphorous are effective in maintaining soil fertility, especially in areas receiving higher amounts of normal precipitation. (Refer to Map 3-2, map pocket, for climatic zones.)

One of the major concerns in soil reconstruction affecting soil reclamation potential is contamination with toxic materials or unfavorable plant growth materials. On-site testing and reclamation expertise are essential in minimizing this concern.

The reclamation potential of the reconstructed soil and landscape is expected to be generally suitable based on the effective utilization of overburden and

favorable plant growth materials in the soil reconstruction and land reclamation process. Some localized, steep areas (about 5 to 8 percent of the area) resembling talus-like slopes could remain in the reclaimed landscape. These areas would equate to the preconstruction occurrence of rock outcrop areas in extent and productivity.

REVEGETATION POTENTIAL

The 7 vegetative types occurring within the area of influence are a composite of several plant communities that occur within the particular climatic and physiographic settings.

They are composed of 3 kinds of vegetation including tree species, brush and shrub species, and grasses and forbs. The time required for restoration of vegetation strata to pre-existing levels will vary greatly between the kind of vegetation. Estimated time requirements and impacts are discussed in Section 3.A.3, Soils and Vegetation.

SUMMARY

It is predicted that successful erosion control, land restoration, reclamation, and revegetation generally would be achieved throughout the project areas provided the applicants implement effective measures and procedures tailored to the kind of land disturbance and to the conditions encountered. It is emphasized, however, that to ensure reclamation success, a strong compliance program accompanied by an effective monitoring and maintenance program is necessary to ensure that applicable measures are applied timely and effectively, and that follow-up measures are carried out. The compliance program would be conducted by the authorizing agencies and landowners for their lands. However, it should be noted that impacts to soils and its potential to produce preconstruction vegetation would be very significant if applicable erosion control, soil reconstruction and reclamation measures are not implemented due to lack of compliance with approved plans and if adverse weather conditions, mainly heavy rainstorms, would occur during construction before any erosion control measures could be installed.

TABLE A-7-2
WATER EROSION RATES ASSOCIATED WITH SEVERAL SOIL EROSION TREATMENT AND REVEGETATION SCENARIOS

Soil, Setting, and Vegetative Cover and Restoration Scenario	Condition, Erosion Treatment, and Revegetation Scenario	Erosion Rates (Tons/Acre/Year)[a]
Midfork Soil—Deep, bouldery, loamy soil forming on colluvial materials derived from sandstone and shale. Annual precipitation of 20 to 30 inches. Slope - 60 percent, 600 feet long. Vegetative cover - aspen, mixed conifer and mountain shrub, 50 percent canopy. (Part of map unit HUG - Midfork - Eldwood complex, 50 to 70 percent slope.)	Current Condition	3.8
Reconstructed soil and topography - slope 30 percent, length 200 feet. Deep (40 inches plus), loamy soil with 18-inch surface soil mantel.[c] (Surface mine area restored.)	Erosion control measures:	
	- exposed soil[b]	72.0
	- 100' water bars	48.0
	- 1 ton mulch	13.0
	- 2 ton mulch	4.3
	- 100' water bars plus 1 ton mulch	8.5
	Reseeding (with 100-foot water bar or terraces)	
	- 2nd year 25 percent understory cover	6.2
	- 5th year 50 percent understory cover	1.9
Beenom Soil—Shallow, loamy soil underlain by sandstone at 6 to 20 inches. Annual precipittion - 16- to 20-inches. Slope - 10 percent, 200 feet long. Vegetative cover - Wyoming Big Sage, grass (canopy 25 percent brush and 40 percent understory). (Part of map unit ODD - Beedom loam, 3 to 15 percent slope.)	Current Condition	0.9
Reconstructed soil and topography - slope 12 percent, length 300 feet. Moderately deep to deep loamy soil with 18-inch surface soil mantel.[c] (Surface mine area restored.)	Erosion Control Measures:	
	- Exposed soil[b]	18.0
	- 100' water bars	9.0
	- 1 ton mulch	3.2
	- 2 ton mulch	1.1
	- 100' water bars plus 1 ton mulch	0.5
	Reseeding (with 100-foot water bars and terraces)	
	- 2nd year 20 percent understory cover	1.6
	- 5th year 40 percent understory cover	0.8
Benteen Soil—Moderately deep (20 to 40 inches) loamy soil underlain by sandstone and shale. Annual precipittion - 20 to 30 inches. Slope - 30 percent, 500 feet long. Vegetative cover - aspen, mixed conifer (canopy 50 percent). (Part of map unit OPF - Benteen - Decross ______ complex 15 to 40 percent slopes.)	Current Condition	2.2
Reconstructed soil and topography - Slope - 20 percent, 200 feet long. Moderately deep and deep loamy soil with 18-inch surface soil mantel.[c] (Surface mine area restored.)	Erosion Control Measures:	
	- Exposed soil[b]	50.4
	- 100' water bars	33.6
	- 1 ton mulch	9.1
	- 2 ton mulch	3.0
	- 100' water bars plus 1 ton mulch	2.0
	Reseeding (with 100-foot water bars or terraces)	
	- 2nd year 25 percent understory cover	1.3
	- 5th year 50 percent understory cover	0.4
Ildefonso Soil—Deep, very stony loamy soils forming in mixed alluvial materials on fans. Annual precipitation - 12 inches. Slope - 16 percent, 1,200 feet long. Vegetative cover - pinyon-juniper and salina wild rye. (Part of map unit IEC - Ildefonso very stony loam, 3 to 8 percent slope.)	Current Condition	5.6

TABLE A-7-2 (Concluded)
WATER EROSION RATES ASSOCIATED WITH SEVERAL SOIL EROSION TREATMENT AND REVEGETATION SCENARIOS

Soil, Setting, and Vegetative Cover and Restoration Scenario	Condition, Erosion Treatment, and Revegetation Scenario	Erosion Rates (Tons/Acre/Year)[a]
Spent Sand Disposal Area Reclamation - Reconstruction soil and topography - benched side slope - 30 percent slope, 100 foot long.	Erosion Control Measures:	
	- Exposed soil[b]	44.8
	- 1 ton mulch	8.1
	- 2 ton mulch	2.7
	Reseeding:	
	- 2nd year 10 percent cover (grass)	20.2
	- 5th year 20 percent cover (grass)	8.9
	- 2nd year 10 percent cover (grass) residual mulch plus contour surface manipulation (contour furrows)	13.1
	- 5th year 20 percent cover (grass) contour surface manipulation (contour furrows)	5.8
	- 2nd year 10 percent cover (grass) residual mulch plus contour surface manipulation (contour forrow) plus 50'	9.0
	- 5th year 20 percent cover (grass) contour surface manipulation (contour furrows) plus 50' interval water bar or slope length reduction	4.0

Note: Soil and vegetation condition selection based on soil survey data from the soil survey of Range Creek portion of Carbon area, Carbon County, Utah.

[a]Based on Universal Soil Loss Equation (USLE) calculations using factors outlined in "Preliminary Guidance for Estimating Erosion on Areas Disturbed by Surface Mining Activities in the Interior Western United States."
[b]Represents a bare, loose soil condition occurring during construction and immediately following regrading. Soil loss estimates are speculative for scopes exceeding 24 percent, as these values are beyond the range of research data. Soil losses are identified as "worst-case" and would require extremely adverse weather and construction conditions.
[c]Surface soil mantel consists of the most favorable plant growth materials spread on the surface of reconstructed soil with surface roughness manipulation on the contour.

APPENDIX A-8
ENDANGERED SPECIES ACT COMPLIANCE

The Endangered Species Act of 1973 requires, under Section 7, that any federal agency carrying out any action that might affect an endangered species must consult with the Fish and Wildlife Service concerning the effects of the project on threatened or endangered species.

The Correspondence contained in this appendix is the Fish and Wildlife Service response to BLM's request for the Section 7 listing of threatened or endangered species.

RECEIVED

JUN 3 1983

EIS OFFICE

31 May 1983

TO: District Manager, Bureau of Land Management, Moab, Utah

FROM: Field Supervisor, Endangered Species Office, U. S. Fish and Wildlife Service, Salt Lake City, Utah

SUBJECT: Species list for Sunnyside Tar Sand Project

We have reviewed your memo of 29 April 1983 concerning a request for a species list for the Sunnyside Special Tar Sand Area. It appears that listed endangered and threatened species, or species proposed for listing, may occur in the area of influence of this action.

To comply with Section 7(c) of the Endangered Species Act of 1973, as amended, Federal agencies or their designees are required to obtain from the Fish and Wildlife Service (FWS) information concerning any species, listed or proposed to be listed, which may be present in the area of a proposed construction project. Therefore, we are furnishing you the following list of species which may be present in the concerned area:

Listed Species

bald eagle	Haliaeetus leucocephalus
black-footed ferret	Mustela nigripes
Colorado squawfish	Ptychocheilus lucius
Uinta Basin hookless cactus	Sclerocactus glaucus

Candidate Species

razorback sucker	Xyrauchen texanus
Canyon Sweet vetch	Hedysarum occidentale var. canoe

Section 7(c) also requires the Federal agency proposing a major Federal action significantly affecting the quality of the human environment to conduct and submit to the FWS a biological assessment to determine the effects of the proposal on listed and proposed species. The biological assessment shall be completed within 180 days after the date on which initiated or a time mutually agreed upon between the agency and the FWS. Before physical modification/alternation of a major Federal action is begun the assessment must be completed.

If the biological assessment is not begun within 90 days, you should verify this list with us prior to initiation of your assessment. We do not feel that we can adequately assess the effects of the proposed action on listed and proposed species or critical habitat and proposed critical habitat without a complete assessment. When conducting a biological assessment, you shall, at a minimum:

1. conduct a scientifically sound on-site inspection of the area affected by the action, which must, unless otherwise directed by the FWS, include a detailed survey of the area to determine if listed or proposed species are present or occur seasonally and whether suitable habitat exists within the area for either expanding the existing population or potential reintroduction of populations;

2. interview recognized experts on the species at issue, including those within the Fish and Wildlife Service, state conservation agencies, universities, and others who may have data not yet found in scientific literature;

3. review literature and other scientific data to determine the species' distribution, habitat needs, and other biological requirements;

4. review and analyze the effects of the action on the species, in terms of individuals and populations, including consideration of the cumulative effects of the action on the species and habitat;

5. Listed fishes may be impacted as a result of water withdrawals from the Green River system. To evaluate possible impacts to listed fishes the following information is needed: net depletion figure (acre-feet), intake volumes and reservoir storage, evaporative losses from reservoirs and reservoir volumes, location timeing, and water quality characteristics of any return flows.

6. analyze alternative actions that may provide conservation measures;

7. conduct any studies necessary to fulfill the requirements of (1) through (5) above;

8. review any other relevant information.

The FWS can enter into formal Section 7 consultation only with another Federal agency or its designee. State, county, or any other governmental or private organizations can participate in the consultation process, help prepare information such as the biological assessment, participante in meetings, etc.

After your agency has completed and reviewed the assessment, it is your responsibility to determine if the proposed action "may affect" any of the listed species or critical habitats. You should also determine if the action is likely to jeopardize the continued existence of proposed species or result in the destruction or an adverse modification of any critical habitat proposed for such species. If the determination is "may affect" for listed species you

must request in writing formal consultation from the Field Supervisor, Endangered Species Office, U.S. Fish and Wildlife Service at the address given above. In addition, if you determine that the proposed action is likely to jeopardize the continued existence of proposed species or result in the destruction or adverse modification of proposed critical habitat, you must confer with the FWS. At this time you should provide this office a copy of the biological assessment and any other relevant information that assisted you in reaching your conclusion.

Your attention is also directed to Section 7(d) of the Endangered Species Act. as amended, which underscores the requirement that the Federal agency or the applicant shall not make any irreversible or irretrievable commitment of resources during the consultation period which, in effect, would deny the formulation or implementation of reasonable and prudent alternatives regarding their actions on any endangered or threatened species.

We are prepared to assist you whenever you have questions which we may be able to answer. If we can be of further assistance, please advise us.

The FWS representative who will provide you with technical assistance is Terry J. Hickman of our Salt Lake City Office ([801] 524-4430; FTS 588-4430).

cc: Official file
Reading file
AFA/SE:WWathen
ES/SLC
Robert Pizel, Project Leader √
Bureau of Land Mangement
555 Zang Street
Denver, Colorado 80228

TJH/jg:5-25-83

13 June 1983

MEMORANDUM

TO: District Manager, Bureau of Land Management, Moab, Utah

FROM: Field Supervisor, Endangered Species Office, U. S. Fish and Wildlife Service, Salt Lake City, Utah

SUBJECT: Addition to species list for Sunnyside Tar Sand Project

On 31 May 1983 we sent you a list of endangered, threatened and candidate species that may be impacted by the Sunnyside Tar Sand Project. After reviewing additional information we would like to add the following candidate species to that list:

long-billed curlew	Numenius americanus
ferruginous hawk	Buteo regalis
spotted bat	Euderma maculatum
sedge fescue	Festuca dasyclada

Thank you for your cooperation in conserving endangered species. If you have any questions concerning the above additions please contact us.

Fred L. Bolwahnn

cc: Official file
Reading file ✓

TJH/jg:6-13-83

APPENDIX A-9
VISUAL RESOURCE MANAGEMENT METHODOLOGY

The BLM's Visual Resource Management (VRM) system was used to analyze the landscape that the proposed actions and alternatives would traverse.

To compare the visual impacts of the proposed projects and alternatives, the VRM system was applied to lands managed by the Bureau of Land Management (BLM), as well as other federal, state, local, and private lands.

The following sections describe the VRM system and the BLM contrast rating procedure, as well as how the VRM system was applied to the proposed projects. A further explanation of each process may be found by referring to the sources used as a basis for the discussion.

THE BLM VISUAL RESOURCE MANAGEMENT SYSTEM

The VRM system is an analytical process that identifies, sets, and meets the objectives for maintaining scenic values and visual quality (BLM 1978, 1980d).

The system is based on research that has produced ways of assessing aesthetic qualities of the landscape in objective terms. Aesthetic judgments considered extremely subjective were found to have identifiable, consistent qualities that can be described and measured. Whatever the terrain and whoever the observer, perception of visual quality in a landscape seems to be based on three common principles:

- Landscape character
- Influence of form, line, color, and texture
- Visual variety

Landscape character is primarily determined by the 4 basic visual elements of form, line, color, and texture. Although all 4 elements are present in every landscape, they exert varying degrees of influence. The stronger the influence exerted by these elements, the more interesting the landscape. The more visual variety in a landscape, the more aesthetically pleasing the landscape. Variety without harmony, however, is unattractive, particularly if alterations (cultural modifications) are made carelessly.

The VRM system (see Figure A-9-1, for flow diagram) involves a 4-step process: (1) determining the scenic quality of a landscape; (2) measuring the visual sensitivity of an area; (3) determining the distance zones; and (4) compiling all the information into management classes for guidance in assessing environmental impacts.

SCENIC QUALITY

Scenic quality is perhaps best described as the overall impression retained after driving through, walking through, or flying over an area of land. In the VRM process, rating scenic quality requires a brief description of the existing scenic values in a landscape.

When inventoried, an area is first divided into subunits that appear homogeneous, generally in terms of landform and vegetation. Each area is then rated by 7 key factors: landform, vegetation, water, color, influence on adjacent scenery, scarcity, and cultural modification. A standardized point system assigns great, some, or little importance to each factor. The values for each category are calculated and, according to total points, 3 scenic quality classes are determined and mapped:

Class A—Areas that combine the most outstanding characteristics of each rating factor.

Class B—Areas that combine some outstanding features and some that are fairly common to the physiographic region.

Class C—Areas where the features are fairly common to the physiographic region.

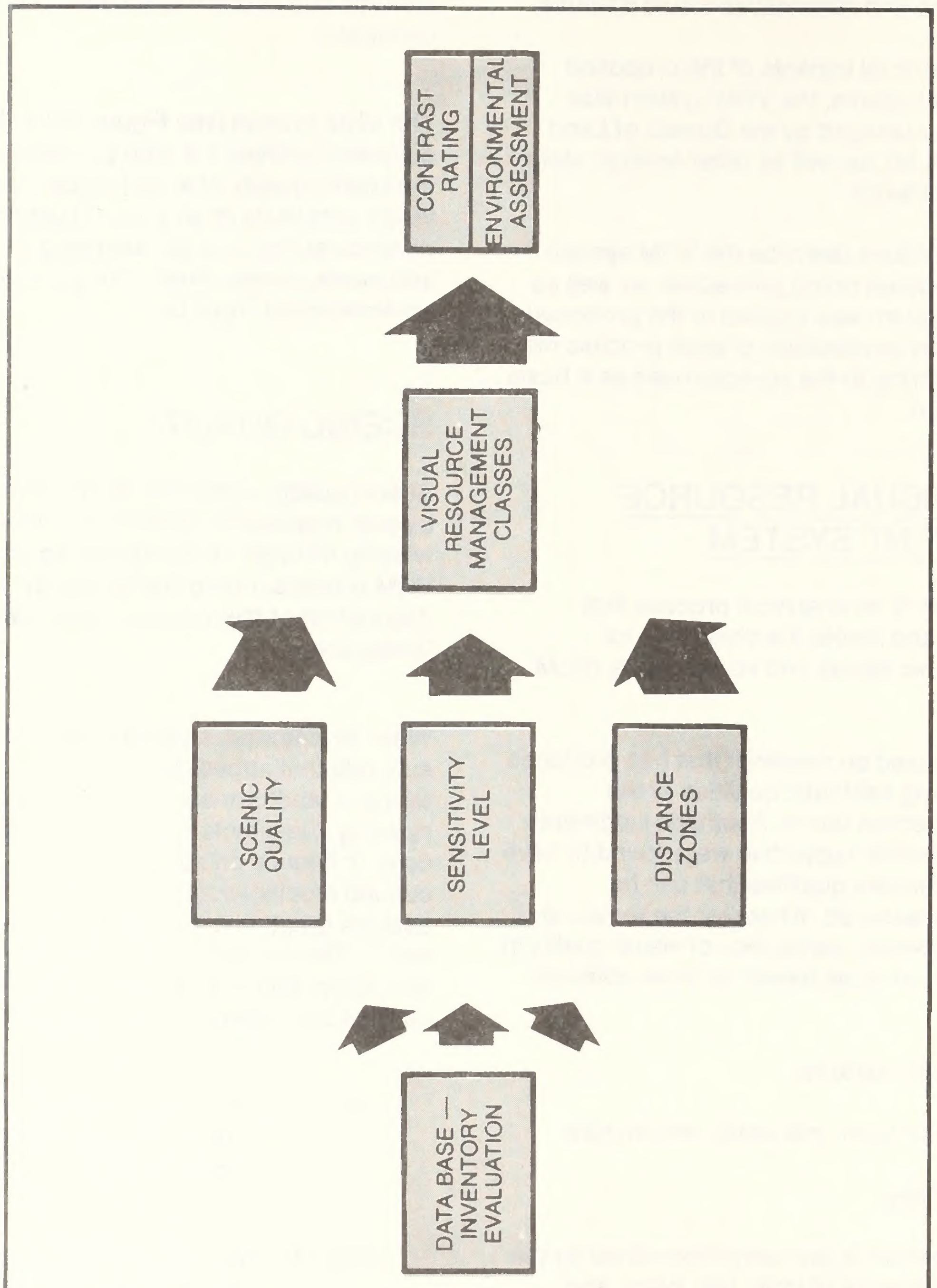

FIGURE A-9-1 THE VISUAL RESOURCE MANAGEMENT SYSTEM PROCESS

SENSITIVITY LEVELS

Although landscapes have common elements that can be measured, there is still a subjective dimension to landscape aesthetics. Each viewer brings perceptions formed by individual influences, culture, visual training, familiarity with local geography, and personal values.

To measure regional and individual attitudes in evaluating a landscape, visual sensitivity is determined in 2 ways:

Use Volume

Frequency of travel through an area (by road, trail, and river) and use of an area (for recreation, camping, and events) are tabulated. The area is then assigned a high, medium, or low rating according to predetermined classifications.

User or Public Reaction

Public groups are familiarized with the area (if necessary) and asked to respond to activities that will modify that landscape. The concern they express about proposed changes in scenic quality is also rated high, medium, or low.

The various combinations of use volume and user reaction for each are converted by a matrix to an overall sensitivity rating of high, medium, or low. A map is then developed that illustrates these sensitivity levels.

DISTANCE ZONES

The visual quality of a landscape (and user reaction) may be magnified or diminished by the visibility of the landscape from major viewing routes and key observation points.

A landscape scene or 'seen area' can be divided into 3 basic distance zones: (1) foreground/middleground; (2) background; and (3) seldom-seen. Because areas that are closer have a greater effect on the observer, such areas require more attention than do areas that are farther away. Distance zones allow consideration of the proximity of the observer to the landscape.

Selection of the key viewing points and accurate assessment of distance zones require some judgment. Where several viewing routes exist, what is foreground from one route may be background from another. In that case, the more restrictive designàtion is used. Atmospheric conditions may also modify the perception of distance.

The process culminates in a final distance zone map.

MANAGEMENT CLASSES

Management classes describe the different degrees of modification allowed to the basic elements of the landscape. Class designations are derived from an overlay technique that combine the maps of scenic quality, sensitivity levels, and distance zones. The overlays are used to identify areas with similar combinations of factors. These areas are assigned to 1 of 5 management classes according to predetermined criteria. The resulting map of contiguous areas sharing the same VRM class is used to assess the visual impact of proposed development.

The 5 classes are:

Class I

This class provides primarily for natural ecological changes; management activities are to be restricted and are not to attract attention.

Class II

Changes in basic elements by management activities should not be evident in the characteristic landscape.

Class III

Contrasts to the basic elements may be evident and begin to attract attention, but they should remain subordinate to the existing characteristic landscape.

Class IV

Alterations may attract attention but should repeat the form, line, color, and texture characteristics of the landscape.

Class V

Rehabilitation is needed to restore the landscape to the character of the surrounding landscape.

THE BLM VISUAL RESOURCE CONTRAST RATING SYSTEM

The objective of the visual resource contrast rating system is to provide a measure of whether the proposed actions will meet the requirements of the assigned VRM classes (BLM 1978 and 1980). The degree to which a management activity adversely affects the visual quality of a landscape depends on the extent of visual contrasts that is created between the activity and the existing landscape character. Contrast is measured by separating the landscape into land and water surfaces, vegetation, and structures and then predicting the magnitude of contrast with the basic elements (form, line, color, and texture) for each of these major features. Assessing the degree of contrast will indicate the severity of impact and will guide the plans for mitigating the contrasts to meet the requirements of the VRM classes. Contrasts are considered from the most critical viewpoints for distance, angle of observation, length of time, relative size of the project, season of the year, light, and the effects of time on the healing process.

The following parameters have been applied to determine if the proposed actions would meet the requirements of the assigned VRM classes.

Class I: The degree of contrast for any one element may not exceed a weak degree of contrast (1x), and the total contrast rating for any one feature may not exceed 10.

Class II: The degree of contrast for any one element may not exceed a moderate value (2x), and the total contrast rating for any feature may not exceed 12.

Class III: The degree of contrast for any one element should not exceed a moderate value (2x), and the total contrast rating for any feature may not exceed 16.

Class IV: The total contrast rating for any feature should not exceed 20.

VRM SYSTEM APPLICATION TO THE SUNNYSIDE PROJECT

The following section explains how the VRM system was applied to the Sunnyside project analysis. The explanations are intended to more thoroughly document how the results of the impact analysis were obtained.

Anticipated areas of landscape modification that would result in high visual contrast if the proposed actions (or alternatives) were to be implemented were evaluated for contrasts. The duration of view, numbers of viewers, angle of observation, relationship to other views, mining locations and techniques, ease of revegetation, and proposed restoration methods (Appendix A-7, Reclamation and Erosion Control Programs) were considered in analyzing the degree of contrast. In addition, other development in the area was considered where applicants' projects are proposed in order to understand the overall change that might be expected for the affected area. The contrast evaluation was concerned with the immediate effects of mining, such as changed landform, removed vegetation, and finished structures, as well as the long-term effects of mining and in-situ recovery processes over the life of the projects. All impacts were considered to be long-term (beyond the life of the projects), because of the long period of commercial operations and length of time necessary to lessen the visual contrast with the existing landscape. Short- term impacts (less than the life of the projects), such as the visual presence of work crews, were not considered.

An additional step was taken to identify areas of highly significant adverse impacts, because the western escarpments and mountains of the main block of the Sunnyside Special Tar Sand Area (STSA) are highly visible to travelers on Highways 6, 10, and 123, and to residents of Price, Wellington, and other valley communities. The mountains serve

as a background to foreground and middleground views from the highways and from these communities. The views are not nearly as dramatic as the background itself, which places added quality on the views. As a result, the local views would be highly degraded if the background were to be significantly altered.

Specific considerations were evaluated for the 3 types of impact-related activities that would occur within the area—resource recovery (surface mining and in-situ extraction), construction and operation of processing plants, and development of spent sand disposal areas. Surface mining considerations included how the ongoing mining would affect and relate to the existing landscape and over what length of time, the type of landform that would exist after rehabilitation, and how it would blend with existing conditions. Differences in visual contrast between the mined and reclaimed area and the existing landscape considered the steepness or flatness of the landform, resultant horizontal lines formed by various levels and headwalls, and whether the reformed landscape would blend visually with the existing landscape. Existing and anticipated vegetation used for rehabilitation were considered in judging the visual contrast that would occur following surface mining and in-situ extraction.

The plant sites were assessed from the standpoint of the visual contrasts that could be anticipated between the existing landscape character and the proposed structures. While the plans of operations do not define exactly how the sites would appear, it was concluded the primary contrast would be between the structure and its siting conditions, rather than a contrast in landform or vegetative modifications.

The spent sand disposal areas were assessed for potential visual contrasts that would occur as a result of modifying, or in most cases, imposing a new and contrasting landform upon the existing landscape. The valley fill disposals retained by earthen dams in rugged terrain with a rolling to hilly surface would not be visually compatible in most cases. The flatter disposal areas would tend to impose a raised landform upon the landscape and the resultant surface configurations would contrast with the existing landscape. In both cases, it could be anticipated that the existing vegetation types would not be replaced in kind during rehabilitation, but, rather would require many years for natural types to invade the area, if at all. Color and textural contrasts could be expected to create a visual contrast in most areas.

Specific contrasts in form, line, color, and texture indicate problems that could require design mitigation. Applying design procedures to the proposed actions could eliminate or reduce visual contrasts to meet the visual planning objectives stipulated in the VRM class designations. If this were done, the projects would be reassessed to determine if they could meet the area's visual goals, and if not, to what degree the landscape's visual resource would be affected.

MAPS

1-2

1-4

1-5

DINOSAUR NATIONAL MONUMENT
COLORADO
UINTAH AND OURAY INDIAN RESERVATION
UINTAH COUNTY
MOFFAT COUNTY
MOFFAT COUNTY
RIO BLANCO COUNTY
DUCHESNE COUNTY
UINTAH COUNTY
OURAY NATIONAL WILDLIFE REFUGE
Chevron Pipeline
Northwest Natural Gas Pipeline
Bonanza Power Plant
WHITE RIVER DAM
SYNTANA-UTAH
PARAHO
TOSCO
MAGIC CIRCLE
Tract U-a
Tract U-b
See Map T-1-2 for Tosco Salt Lake City Alternative Product Pipeline
To Plateau Refinery
ENERCOR (Rainbow) = E
E-A1 White River Section 12, Range 23E Alternative Water Supply System
E-A2 Green River Alternative Water Supply System
E-A3 White River Section 12, Range 24E Alternative Water Supply System
E-A4 Green River Southern Loop Alternative Water Supply System
E-A1 Paraho Tie Alternative Power Transmission Line
E-A2 Southern Loop Alternative Power Transmission Line
MAGIC CIRCLE = M
M-A1 White River Alternative Water Supply System

MAP R-A-2 UINTAH BASIN SYNFUELS PROJECTS ALTERNATIVES
(Tosco Salt Lake City Alternative Product Pipeline shown on Map T-1-2;
Tosco Blocking-Up Alternative shown on Map T-1-3.)

MAP 1-4 SURFACE OWNERSHIP AND FEDERAL TAR SAND OWNERSHIP

MAP 1-5 PARTIAL CONVERSION ALTERNATIVE

MAPS

3-1

3-2

3-3

MAP 3-1 WATER RESOURCES

Sunnyside Combined Hydrocarbon Lease Conversion EIS — September 1983

MAP 3-2 CLIMATIC/RECLAMATION POTENTIAL ZONES AND GRAZING ALLOTMENTS

Sunnyside Combined Hydrocarbon Lease Conversion EIS — September 1983

MAP 3-3 WILDLIFE HABITAT: DEER AND FERAL HORSE

MAPS

3-4

3-5

MAP 3-4 WILDLIFE HABITAT: ELK, SAGE GROUSE, CHUKAR PARTRIDGE, COLD-WATER FISH AND RAPTORS

Sunnyside Combined Hydrocarbon Lease Conversion EIS — September 1983

MAP 3-5 VISUAL RESOURCES, SECONDARY TRANSPORTATION NETWORKS, AND WILDERNESS RESOURCES

Form 1279–3
(June 1984)

BORROWER'S

DATE LOANED	BORROWER

USDI – BLM